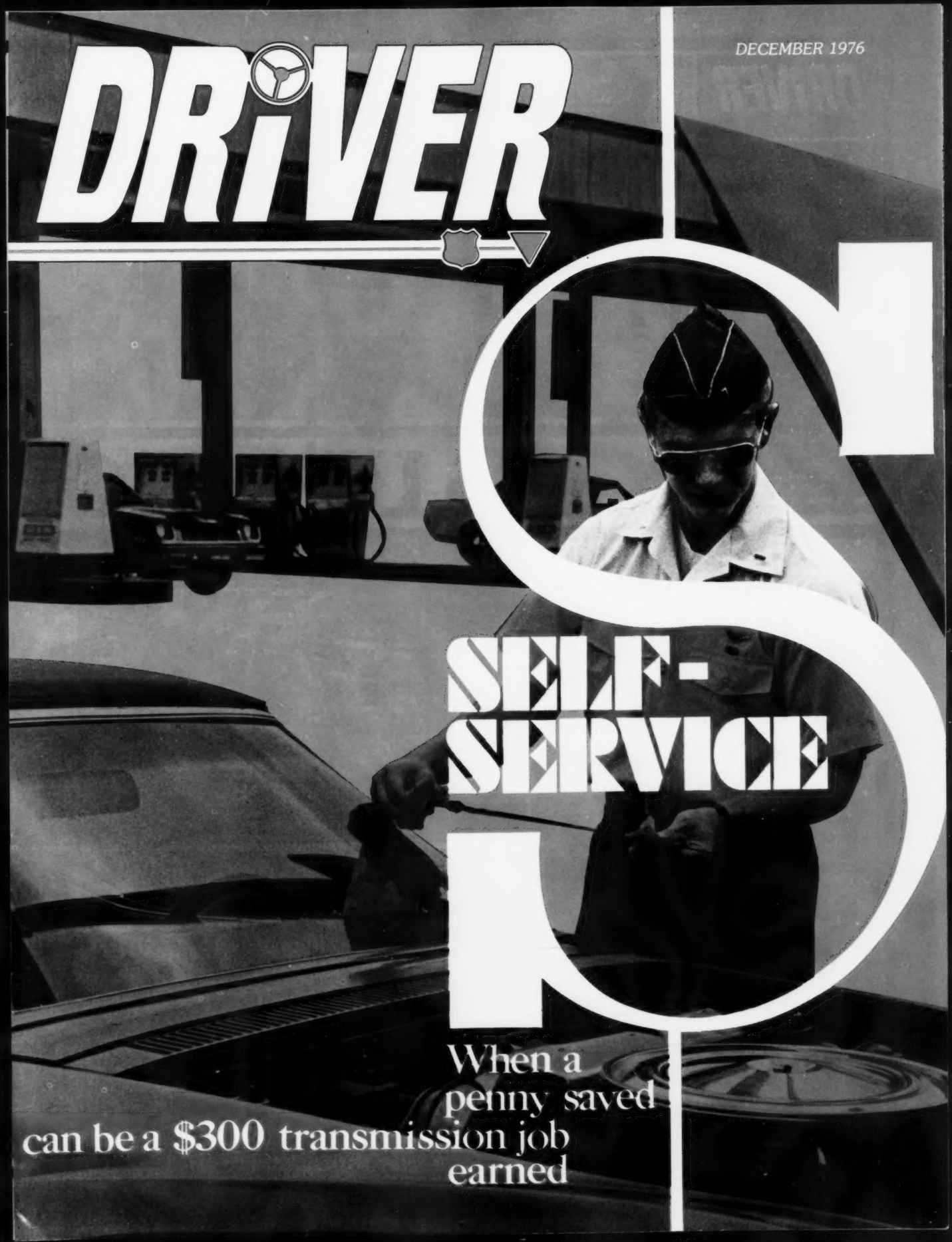
DRIVER

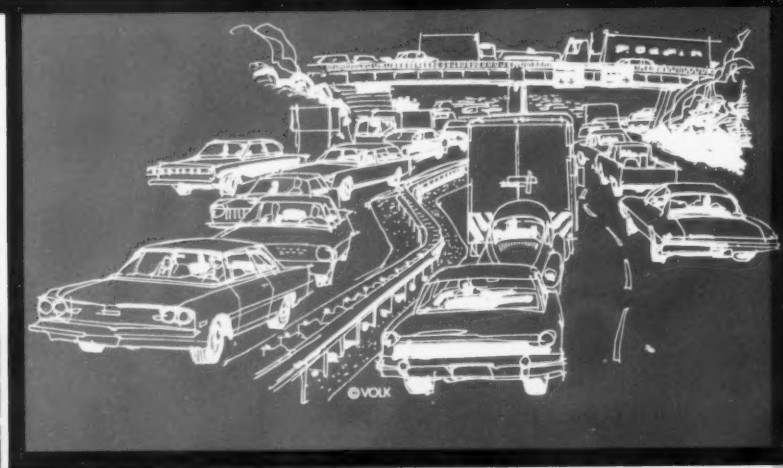
DECEMBER 1976



SELF-SERVICE

When a penny saved can be a $300 transmission job earned

SELF-SERVICE GAS UP 'n' GO?



10 to 15 minutes with your car every pit stop may add years to its life

Five years ago, no service station attendant worth his salt would permit you to gas up your own car. But the Middle East oil embargo and subsequent skyrocketing of world fuel prices changed all that. In the United States today, one of every four stations is completely self-service, while most of the remaining stations feature pumps where you can fill your own tank.

Why this sudden do-it-yourself craze? To save money—why else? And therein lies our problem.

If you're going to pump your own gasoline, who's going to wash the windshield, check the water, tires, and battery, and perform all those other little chores a service station attendant would normally do for you?

Yours truly, natch!

May sound tacky but if you look around the next time you pull into a station for self-service, you'll probably see very few drivers taking the extra few minutes necessary to really "service" their own vehicles other than to gas up. This means that more autos than ever before are (1) requiring costly repairs before normally due and (2) heading for a possible accident because of driver neglect.

Auto club officials are warning their members either to pay more for their gasoline and have their cars fully serviced—it could be cheaper in the long run—or to get into the habit of checking over their cars at every fill-up. Since the typical American motorist saves from five to 10 cents a gallon by filling his own tank, he can pocket $48 to $96 annually if he drives 14,500 miles a year and averages 15 mpg. But measure that against unnecessary maintenance bills for a new battery, a new tire, maybe rodding out a rusty radiator, and one realizes how quickly his savings can evaporate.

Add to this gloomy picture the possibility that an underinflated tire could overheat and blow out causing an accident because no one had pressure-checked it for several hundred miles, or a driver who fails to see a bicyclist in time because of a dirty windshield. The serve-yourself concept of thrift suddenly goes up in smoke.

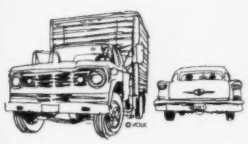
Millions of budget-conscious drivers are daily practicing both thrift and safety, however, by taking an extra 10 to 15 minutes to give their cars a basic service check every time they gas up. Some have learned to work in pairs—two buddies, husband and wife, father and son, mother and daughter—to get the job done quicker and more efficiently. Any way you approach the task, don't leave out the basics.

The first thing you want to do, of course, is get gas. Although the lowest

continued

Out pops your receipt from this completely automatic, self-service machine that takes credit cards or cash, sets your pump and gallonage, turns on and off fuel flow.

(far left, middle left, near left) **Signs show the way** to self-service . . . following printed instructions is particularly important.



DRIVER

THE TRAFFIC SAFETY MAGAZINE FOR THE MILITARY DRIVER

DECEMBER 1976

VOLUME 10 NUMBER 7

CONTENTS

FEATURES PAGE

Self-Service: Gas Up 'n' Go? 1
Silicones 8
3 for the Road 12
When Will the Fun Start? 14
Driving Through Water ..... Back Cover

DEPARTMENTS

Double Clutch 2
The DRIVERS 13
Timely Topics 18
In the Driver's Seat 20
The Backyard Mechanic 22
Backfire 27
Tuneup 29

DEPARTMENT OF THE AIR FORCE ■ HQ AIR FORCE INSPECTION AND SAFETY CENTER
Norton Air Force Base, California 92409

Lt Gen JOHN P. FLYNN
The Inspector General, USAF

PUBLISHED IN COOPERATION WITH THE DEPARTMENT OF THE ARMY AND THE DEPARTMENT OF THE NAVY

Dr. FRANCIS S. McGLADE
Director of Safety
United States Army

Maj Gen RICHARD E. MERKLING
Director
Aerospace Safety USAF

RADM ROBERT F. DUNN
Commander
Naval Safety Center

Col DAVID E. RALEY
Chief, Safety Education Division

VIRGINIA HENDRIX
Editor

SSgt DON HOLT
Technical Editor

FRANCIS R. (FRAN) FOWLER
Feature Editor

DON KELLEHER
Art Director

MSgt BILL FOSTER
Staff Artist

MSgt MIKE KEEFE
Staff Photographer

ALICE MILKEY
Editorial Administration

AFRP 127-1

SUBSCRIPTION—DRIVER is available on subscription for $8.65 per year domestic; $2.20 additional for foreign mailing, 75c per copy, through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. Single copies will be sold and back copies will be furnished when available. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. No payment can be made for manuscripts submitted for publication. Contributions are welcomed, as are comments and criticism. Address all correspondence to the Editor, DRIVER Magazine, AFISC/SEDD, Norton AFB, CA 92409.

ATTENTION DEPT OF THE NAVY PERSONNEL: Address all queries concerning distribution to NAVSAFECEN, NAS, NORFOLK, VA 23511, Attn: Safety Publications Dept. All other correspondence will be welcomed by the Editor.

The contents of this magazine are informative and should not be construed as regulations, technical orders, or directives unless stated. Address reprint requests, stating intended use of material, to the Editor. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning.

Certain individuals shown in this magazine are not members of the Air Force and therefore do not conform to Air Force grooming standards.

THE EDITOR SPEAKS

DOUBLE CLUTCH

SCARE TACTICS

If you've been reading DRIVER very long, you know we don't believe in scare tactics. We doubt that pictures of crushed vehicles or descriptions of broken heads really motivate anyone to be a better driver or rider. Sometimes, though, we are simply overwhelmed by the accident data that passes across our desks and feel compelled to talk about it to you readers.

Did you know that, unless we do something pretty drastic, one out of every two children born today will be involved, killed or injured, in an automobile accident?

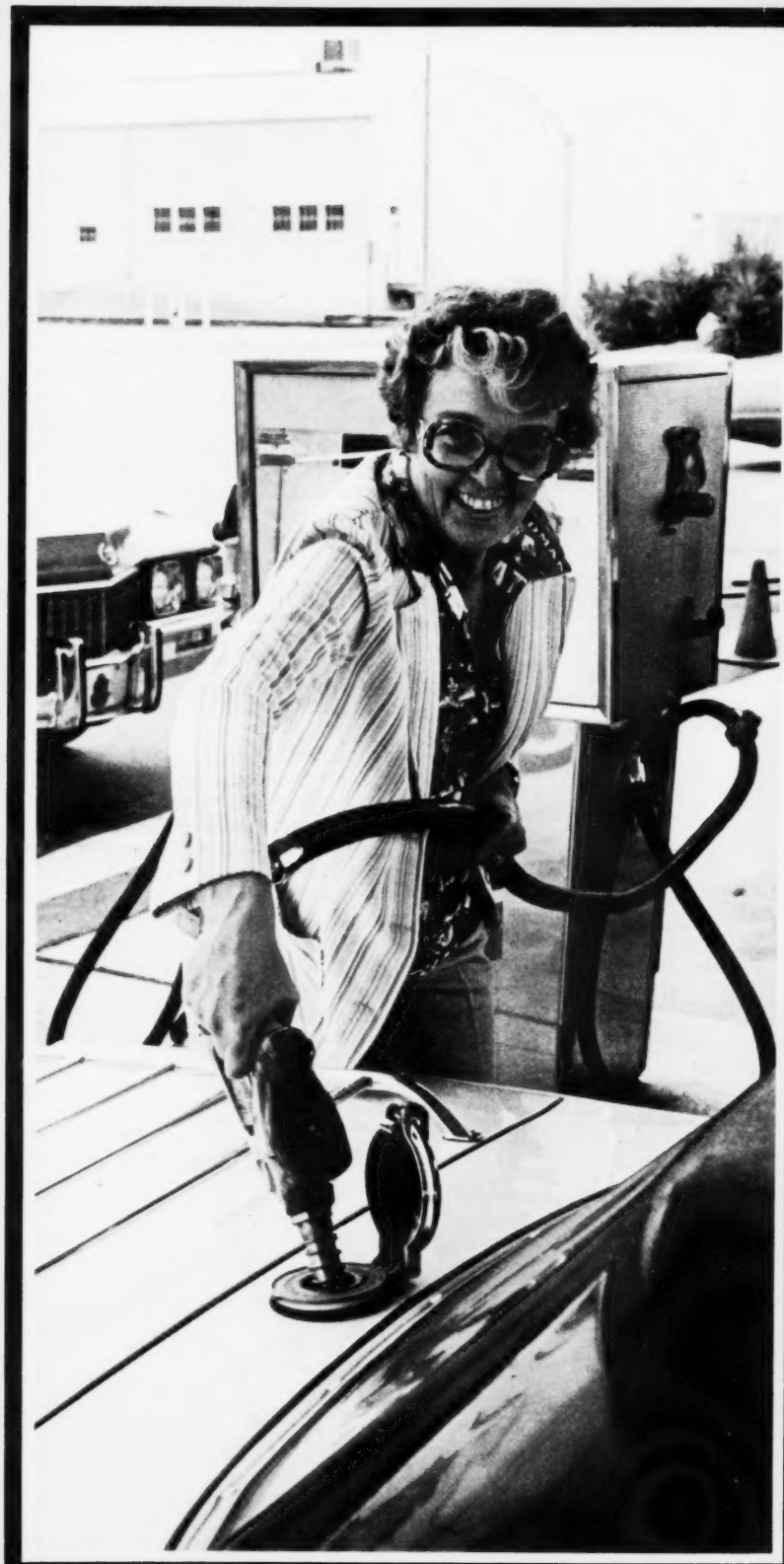
This year, one out of every four persons who drive will be in an accident. More than 50,000 men, women and children will be painfully, tragically killed this year. Smashed and broken, pummeled and lacerated to death. About *two million* will be seriously injured in traffic accidents—this year! Actual dollar cost? About *nine billions!*

This morning in the U.S., 63,000 people got up and calmly began their day without realizing that before tonight is over, they will be dead, or in the hospital, or have had a traffic accident of some kind.

Eleven thousand teen-agers will have accidents today, another eleven thousand tomorrow, and every day thereafter. Unless we do something.

Why? Psychiatrists believe that we drive as we live. If our personal life is marked by caution, tolerance, foresight and consideration for others, then we will drive that way. But the person without these characteristics will drive aggressively, perhaps with anger, and *he will have a much higher accident rate than his more stable friend.*

When you get in your car today, or on your bike, say one thing to yourself: Be cool.



Topping a tank can be wasteful and dangerous. Allow enough room for fuel expansion, especially in hot weather.

price per gallon is probably your objective, don't pick a self-service station for price alone. Select one that not only sells the grade of fuel your car needs but also has facilities for you to service your car. Some stations, believe it or not, have been stripped of everything except pumps and a cash register—you won't even find a water or air hose—and they may not even sell oil. Steer clear of such buck chasers!

It may also be raining or snowing, or you're all dressed up and don't want to risk getting your Sunday silks soiled. You can still pick a mini-serve station and save two or three cents a gallon versus total self-service and a slightly larger savings. The whole idea, regardless of who does it, is to service your car every time you gas up.

To gas your own wheels, first, turn off the vehicle's ignition and get rid of your cigarette if you smoke. Removing the cap from an unvented gas tank with a lighted cigarette dangling from your lips could be suicidal. You'll hear a hissing sound as the cap is removed and air rushes in to fill the vacuum. Then, KER-BOOOOM! Easiest way in the world for a spark to be sucked into the tank.

Most drivers know where their car's gas cap is located, but it's a good idea to show everybody who drives the car just exactly where it is and how to remove it. Auto designers have hidden some caps so well that not even a service station attendant can find them.

OK, if you've read and understand the directions to operate your particular self-service unit (ask the attendant if instructions aren't already posted); if you've double-checked the price-per-gallon window to make certain you've picked the right fuel and pump; and the total-cost window reads "$00.00," you should be ready to lift off the fuel hose and nozzle. Always keep the nozzle upright and vertical when it's out of the tank and pointing down as much as possible when it's in the tank.

Most states now have a law forbidding self-service pumps with nozzle devices which permit you to lock open the fuel flow valve and leave the hose unat-

continued

continued

SELF-SERVICE: GAS UP 'n' GO?

tended. It's a heads-up safety idea to prevent possible fuel spill-over. Gasoline on concrete not only is a fire hazard, it's also slicker than greased lightning when mixed with water. Always walk carefully in gas spill areas.

All nozzles are supposed to be fitted with an automatic shutoff valve. On the bottom side of the nozzle is a little brass ball that operates on gravity and automatically shuts off when the fuel backs up in the nozzle. If, however, you have to insert the nozzle sideways or horizontally because the filler neck on your gas tank is in an "impossible" position, squeeze the trigger gently while filling and shut off the flow before it splashes over.

On vented filler necks, if the pump shuts off automatically, nine times out of 10 the tank is full. On nonvented tanks which contain a lot of trapped air, however, you may have to wait five or 10 seconds between squeezes of the fuel flow trigger to inject the final few gallons. Don't top it off—always leave some space for fuel expansion.

There should be no need to worry about pumping leaded gas into an unleaded fuel tank, because leaded nozzles are too large for unleaded filler necks.

Don't forget the gas cap. A good, locking type costs from $4 to $7 but is worth it to prevent not only gas pilfering but, more important, vandalism such as sugar in the fuel tank. (If you know this has been done to your car, don't operate the engine one minute or it'll lock up tighter than a drum. Just resign yourself to having the gas tank removed and boiled out, fuel lines cleaned, and possibly a carburetor boil-out. Some insurance policies will cover such costs under their vandalism clause.)

Make sure that you tighten the gas cap securely. Caps on most 1975, '76, and '77 model autos are threaded and ratcheted so you know when they are on tight enough. Others have a lip which you must turn a quarter- or half-turn. Still others, especially the locking variety, have spring tension and must be pushed on and turned slightly to fit.

Now comes the most important and least expensive phase of your vehicle's pit stop—servicing its regular operational needs, better known as preventive maintenance. And don't drive away without taking care of these needs just because there's another car behind you with an impatient driver waiting to gas up, unless, of course, the station has a separate self-service area for you to use. Most good stations do nowadays.

Here's a rundown of self-service items listed in a sequence that should make it easier for you to perform them. If you've got a helper, one of you can take the outside of the car, the other can go under the hood.

TIRES

You usually can tell if your tires need air by carefully eyeballing each one, but don't rely on this method for more than a few weeks at a time or about 500 miles of driving. Carry your own pressure gauge—most air pump gauges either don't work or are inaccurate by several pounds. And don't forget to check the spare tire about once a month.

It's better to drive with your tires inflated a couple of pounds above the car manufacturer's recommended figures

Only a few seconds are needed to check hoses, clamps, drive belts, and wiring for wear, cracks, cuts, snugness, and loose connections.

Cars get thirsty, too. Radiators require periodic checks of water and coolant levels.

than a few pounds under, but in no case should the pressure exceed the p.s.i. maximum molded into the sidewall of each tire. Also take time to visually check for tread wear, cracks, damage, and irregular wear. Could be that one or more of the tires is out of balance or out of round, or maybe the car's front end needs realignment.

WINDSHIELD, WIPERS, REAR AND SIDE WINDOWS, MIRRORS

Try never to leave a station unless you clean your windshield and wipe off the edges of the wiper blades first. Blades that smear when clean need replacement. Good service stations provide water with a cleaning solution formulated to penetrate bugs and road scum. Plain, hard, calcified water furnished by most stations just won't cut it, and your windshield wipers won't either; therefore, carry your own finger pump 'n' spray bottle of window cleaning solution, a rough-surface synthetic sponge, squeegee, and a roll of paper towels.

Good visibility in all directions while driving is essential, so take the extra couple of minutes necessary to also clean the rear and side windows and all mirrors. Check mirror adjustments for the driver at the same time.

HEADLIGHTS AND TAILLIGHTS

Although it's one of the quickest, easiest jobs to perform, most motorists fail to wipe off head and taillights during fuel stops. Dirty lenses can reduce the effectiveness of headlight beams by as much as 75%, while dirty taillights make it more difficult for motorists following you to maintain a safe stopping distance. Gassing up also is an excellent time to check the operation of your lights—have someone step on the brights and dims, pump the brake lights, and flick the left and right turn signals while you watch for burnouts or short circuits.

FLUID LEVELS

If you and others who drive your car continually use self-service stations and don't check engine fluid levels regularly, you run the risk of major malfunctions and giant repair bills. Why? Because those dashboard "idiot lights" that many drivers depend on can simply burn out or the sending units that actuate them can fail. Then, too, for some fluid requirements there are no warning lights—just strange sounds from under the hood that indicate you probably waited too long to service them.

DO-IT-YOURSELF KIT FOR GAS STOPS

As self-service gas stops become more popular with every rise in fuel prices, what to carry to service your car quickly and efficiently without clutter takes on new meaning. DRIVER has prepared a suggested list of basic tools and service items that shouldn't take too much room in your car trunk.

1. Windshield cleaner fluid in a finger pump 'n' spray bottle.
2. Rough surface synthetic sponge, squeegee, and a roll of paper towels for keeping windows, mirrors, and lights clean. (Towels are also handy for wiping dipsticks and dirty hands.)
3. Bottle of windshield washer solvent.
4. Tire pressure gauge and a Lincoln-head penny for checking safe tread depth.
5. Jug of distilled water for battery cells.
6. Hydrometer for checking battery cell conditions.
7. Two or three cans of premium grade engine oil (SAE 10W-40 or 20W-50).
8. Oil-can spout (one that doesn't leak around the punch-hole).
9. Quart of transmission fluid (choose according to make of your car).
10. Transmission fluid funnel with long, flexible neck and reducer fitting so it can also be used for oil, power steering fluid, and (if clean) gasoline.
11. Can of hydraulic brake fluid (for drum or disc type brakes).
12. Tools: Pair of pliers, adjustable end or crescent wrench, Phillips and standard blade screwdrivers, battery post cleaning socket.
13. Miscellaneous: Heavy-duty flashlight, pair of leather-palmed work gloves, old bath towel, can of lanolin-based solvent for cleaning dirty hands, and the owner's manual for your particular vehicle.

1. Radiator (Water and Coolant)

To check water or coolant levels if the engine is hot, leave the engine running, play the water hose across the radiator for two or three minutes, turn off the ignition, take a heavy towel or rag or gloves and gently remove the cap, letting air escape slowly until the pressure is gone. Don't put your face over the radiator opening to peer into it, because boiling hot water may still spurt out.

Although this kind of a check seldom is necessary for a well-maintained radiator, it's the only way to periodically inspect for rust or corrosion in the water; to have a coolant sample analyzed by the service station attendant for maximum and minimum temperatures; and to perform pressure checks for a leak in the cooling system or a defective thermostat or radiator cap. Coolant should be changed about once a year.

This is also the moment to check the coolant overflow system. Check the hose running from the radiator to the overflow container, making sure there are no leaks, and ascertain that the container cap fits firmly. Takes only a few seconds.

2. Battery

A battery check by a gas station attendant usually consists of removing the caps for a fast look-see at water (electrolyte) levels; a quick squirt of ordinary water from a hose or battery pitcher if the cells are low; and away you go. But since you're now solely responsible for the heart of your car, why not do it right?

First, carry a plastic jug of distilled water (about 45¢ a gallon at a supermarket) in your car's trunk at all times. Don't jeopardize the life of your battery with hard mineral water. Clean the terminals and cable clamps regularly to prevent corrosion buildup with an inexpensive battery cleaning tool (about 75¢) which looks like an oversized, double socket. Make sure that none of the cables or the ground wire is cracked or broken and that all connections remain clean, dry, and tight for year-around, all-weather performance. It's also a good idea to carry your own hydrometer (about $1.75) to check cell conditions every 1,000 miles and during extra cold or hot weather.

3. Windshield Washer Solvent

If you want your windshield washers to work, don't forget now and then to

continued

Safe tire tread depth can be measured with a scaled gauge like this motorist is using or an ordinary Lincoln-head penny.

Cleaning your windshield and wiping gunk from the edges of the wiper blades should always be done together.

Don't forget to wipe off those head and taillight lenses. Dirty lenses can cut headlight efficiency up to 75%.

add water and special anti-freeze cleaning solution (about 65¢ a quart) to the solvent container. Also inspect connecting vacuum hoses for cracks and leaks and the jet orifices in the sprayer heads for dirt.

4. Crankcase Oil

The lifeblood of your car's engine deserves the dipstick treatment at least every 500 miles. As soon as it shows "a quart down," add a can of premium grade, year-around, multi-viscosity oil (SAE 10W-40 or 20W-50, depending on the make of vehicle you drive). Although most self-service stations will sell you a quart for 90¢ to $1.25, you can buy your own supply of name brand, premium oil at most discount, drug, grocery, and military exchange stores for about 50¢ to 65¢ a quart. Buy a good, leak-proof, metal pouring spout, and you'll be in business to save money and costly maintenance—permanently! Some stations will gladly loan you an oil spout as a do-it-yourself customer, if you ask.

A few suggestions: Serving yourself has its hazards. Adding oil can be messy so use a funnel if necessary. Be careful not to burn your hands on hot engine parts. And, if you are unfamiliar with the maze of gizmos sticking up from the engine block, be very careful not to put the oil in the transmission filler. This can change the viscosity of the transmission fluid causing the transmission to lock up or, at the least, make shifting difficult.

5. Transmission Fluid

The experts tell us that the greatest cause of transmission breakdowns is the failure to change fluid often enough. Although the filler neck is usually hidden and hard to reach, it's worth the effort to find it and at least every 1,000 miles check the dip stick while the engine is idling. Transmission fluid is relatively inexpensive (about 60¢ a quart), but shop carefully because there is one type for

Transmission and oil dipsticks are usually hard to find, but periodic fluid level checks will pay big dividends.

Well-equipped self-service areas like this one located away from gas pumps make tire pressure checks quick and easy.

Oil is the lifeblood of every piston engine. Checking the crankcase dipstick every 500 miles is a must.

Your battery deserves the best. Try to use only distilled water to replenish low levels of electrolyte in the cells.

Ford products and another for GMC, Chrysler, and AMC vehicles, and a third type for most other makes. Again, be careful you don't put transmission fluid into the crankcase. It won't be disastrous, but it will cause the oil's lubricating ability to go down and the seals to swell. Then, when the fluid burns away well below the operating temperature for oil, the seals will shrink, causing leaks.

6. Power Steering and Brake Fluids

Don't wait for an oil change or periodic lube job to check fluid levels in your power steering and brake units, because a loss of either of these vital functions generally occurs suddenly. It takes only a few seconds to check them when you tank up, and it could save your life in a traffic situation.

MISCELLANEOUS ITEMS

Another minute under the hood should be devoted to inspecting all drive belts (fan, generator/alternator, power steering, and air conditioning compressor) for wear, cuts, and snugness; miscellaneous hoses, clamps, and wiring for wear, cracks, and loose connections; and occasionally the easy-to-reach air filter. Then before you drive away, toot your horn—just in case!

You can't do everything every time you gas up but, depending on the make of your auto, the manufacturer may also suggest a few items we've missed. So, spend a little time at home some evening with a good book, your car owner's manual!

Because you'll probably rotate several of these chores between gas stops, the whole self-service operation should not take more than 10 to 15 minutes on an average. That is—if the station you patronize has adequate facilities and you carry basic tools and service items (see our suggested list).

Your car may fare better and last years longer with self-service than it ever could under full-service. Only you have the answer.

SILICONES

This guy comes up to you at a cocktail party—he's heard you're a car nut—and he figures he'll put it to you a little. His opening attack is the usual, the obvious—" . . . dangerous . . . polluting . . . waste of gas . . . waste of money . . . death wish." Then he lands what he thinks is the clincher.

"What has motor racing ever done for passenger cars—except for the rear view mirror, of course?"*

Next time this happens to you, don't answer with a four-letter word. Try a nine-letter word—s-i-l-i-c-o-n-e-s. Since his knowledge of silicones will probably be limited to their use by topless dancers, your reply may slow him down sufficiently to get in a counter attack.

Some people think that "silicone" is a kind of magic ingredient. Add a pinch to oil and you get silicone oil. Add a pinch to rubber and you get silicone rubber. Actually, silicones are a broad family of synthetic materials based on a special branch of chemistry. Silicones may be regarded as high-performance versions of familiar "organic" materials.

Silicone oils and fluids have outstanding resistance to high or low temperatures, making them excellent hydraulic fluids or lubricants at extreme temperatures. They repel water and have unusual surface properties that add protective qualities when used in products ranging from car polish to hand creams. Recent silicone research has produced a new family of lubricants which have advantages over conventional lubricants throughout their complete temperature range. Silicone rubber resists temperature extremes, ozone, moisture and other factors that make ordinary rubber turn hard and brittle. A special family of silicone rubber can be applied as a liquid or paste to produce an excellent adhesive, sealant or formed-in-place gasket. Silicone resins are the base materials for high-temperature paints and electrical insulation.

There's one other characteristic of everything made from silicones—they are *expensive*. And while many automotive uses for silicones derive from the race track—where cost is less of a consideration than on the street—the cost factor is definitely not appealing to automotive product planners who know that somewhere, computers are whirring feverishly, multiplying every fraction of a cent of added production cost by millions of cars in order to calculate the effect on corporate profits. Under these circumstances, materials like silicones are likely to be considered for use only as a last resort.

One of the first "last resort" uses was in the automatic transmission front pump seal. Earliest experiments in automotive automatic transmissions date from 1924, but it was probably the introduction by General Motors of the Oldsmobile Hydramatic, in 1940, which pushed the device across the line dividing fantasy from fact. Still, in those early days, if you bought a car with an automatic, you could plan on an expensive overhaul unless you traded the car at exactly the right time. The problem was invariably the front pump seal, which, literally, couldn't stand the heat.

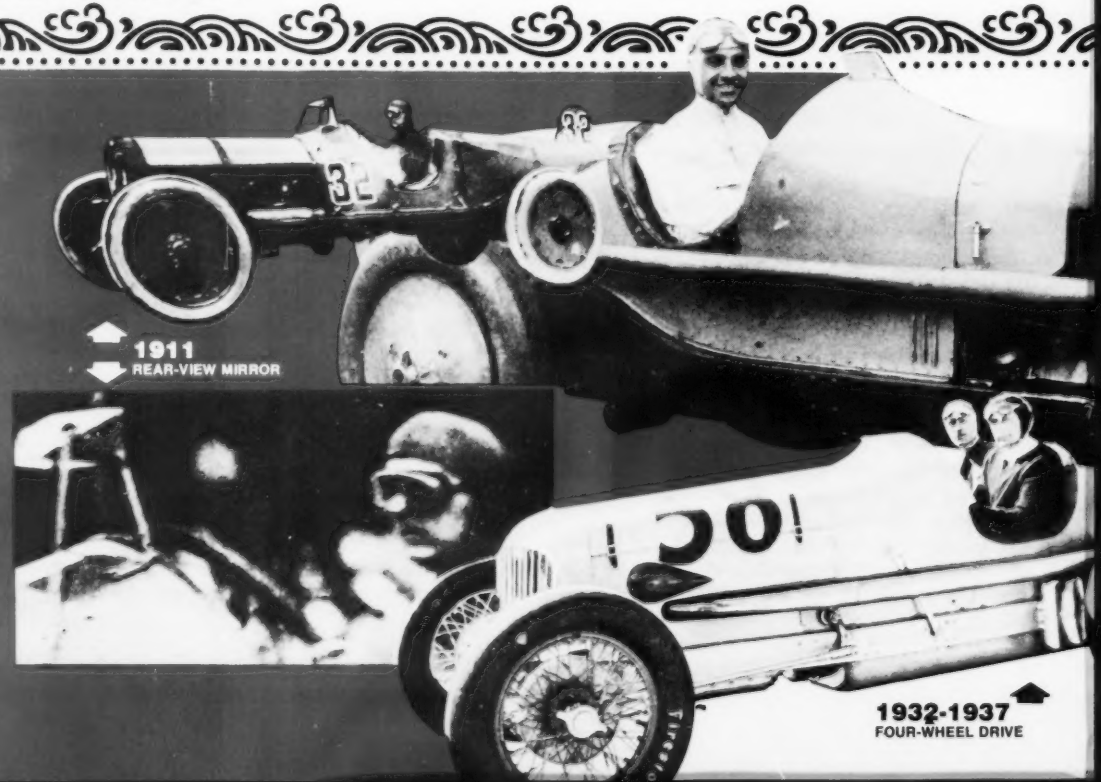
The seal itself was inexpensive, but replacing it was a major job. A new type of seal made of heat-resistant silicone rubber was eventually developed. Its use soon became standard industry

*FOTO FOOTNOTE

Even though this is an article about silicones, we would hasten to add that racing has contributed a little more than the rear view mirror to passenger cars. Would you believe pneumatic tires, four-wheel brakes, safety helmets and fire resistant clothing, disc brakes, roll bars and cages, front-and four-wheel drive, fuel bladders and fuel transfer systems, and good-handling racing tires.

And how about the retaining walls we see on our freeways? They were developed and used first at Indy. Also developed from racing are many of the specialized pieces of fire-fighting equipment. The technique of magnafluxing (non-destructive inspection) is a direct result of racers wanting to know about the internal condition of wheels, suspension components, etc.

See the accompanying photos for a look at the men and machines that have helped the passenger car reach the levels of safety and reliability that it has attained today.



practice and the automatic transmission became one of the most reliable components of the car.

Although for many years Detroit was able to design around silicones, in most cases, and use less expensive materials, smart race car builders didn't depend on the auto industry alone for new ideas. Racers are more apt to look to the aircraft industry or the military, where performance is generally rated ahead of cost. Here silicones were gaining wide acceptance. Racers soon learned that they could get silicone-insulated high-temperature ignition cable and spark plug boots if they ordered by military spec number. Today silicone ignition cable is standard on many cars and readily available from auto parts suppliers. Silicone insulating materials used to "pot" military electronic components were equally good to assure that electrical connections in a car didn't vibrate loose, and to isolate the car's instruments from vibration. It now appears that silicone potting will be an important factor in the reliability of the lean-burn devices being developed by major auto manufacturers.

Formed-in-place silicone gaskets for automobiles were almost totally a development of the racing fraternity. Engine builders started assembling engines without any gaskets except for the head gasket. Instead, they used the same silicone sealants being used to seal space capsules. Even head gaskets were coated with a high temperature silicone sealant to assure a tight, lasting seal. Auto engineers, many of whom are involved in racing, liked the performance of formed-in-place gaskets so much that auto manufacturers have developed highly sophisticated, computer-controlled equipment to apply them automatically. In high-volume production this makes them even more economical, in some applications, than the less effective pre-formed gaskets.

High-temperature silicone engine paints were another material that first found acceptance among racers and car enthusiasts, who put a premium on appearance under the hood.

Today, the silicone products creating the greatest controversy in the automotive field are the recently developed silicone brake fluids. Brake fluid performance is a matter of concern to the auto industry, government, the military and the Society of Automotive Engineers. It should be of equal interest to the race driver and the average motorist.

No, they're not funny ice cream

Reprinted by permission from
SPORTS CAR, August 1976.

by ALLAN ANDERSON
Technical Director, Yankee Silicones, Inc.

The subject of the controversy is familiar. A new product is available which is now generally recognized to be superior. But it is also more expensive. Are the properties of this new product—silicone brake fluid—*really* needed, or is there danger of over-engineering and passing the extra cost along to the customer? As a car owner, your first question may be, "How expensive is 'more expensive'?"

Today you can buy a pint of silicone brake fluid, enough for most cars, for about $5.50. A competition grade silicone brake fluid will cost you about $7 at a discount. A fair premium over a conventional brake fluid that you can buy in your local discount store for about $3 per pint. However, it's a pretty small price to pay if it means the difference between your car stopping and not stopping—and there is evidence that this may be the case, particularly in competition driving.

How good does a hydraulic brake fluid need to be? Basically almost any liquid will serve as a hydraulic fluid. All that is required is that when the fluid is placed in a closed system, pressure applied at one point in the system will be transmitted to any other point in the system.

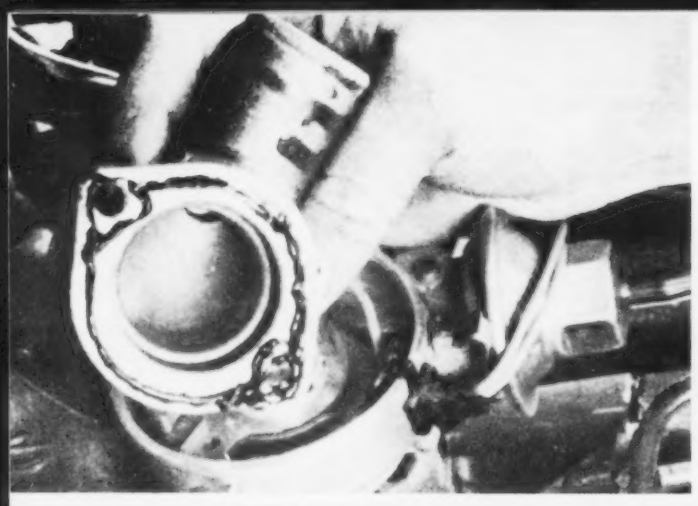
Some interesting examples of the emergency use of various hydraulic fluids in aircraft hydraulic systems, very similar in function to your car's brake system, came out of World War II. One plane, carrying an undeclared case of Scotch whiskey on a routine flight between St. Thomas and Puerto Rico, developed a serious leak in its hydraulic system. The flight crew found that Scotch was a perfectly adequate hydraulic fluid, an explanation that did not go over too well with the troops who had financed the project. Another plane crew, forced down in the North African desert, had a more serious problem. They patched the plane up, but did not have enough fluid to fill the hydraulic system. There is not much liquid available in the desert, but necessity again gave birth to invention. The controls responded to a system filled with urine as a hydraulic medium and the plane was flown to safety.

All of which goes to prove that water is a possible hydraulic fluid, provided the system contains no parts that will rust or corrode in the presence of moisture and that no part of the system will ever operate at a temperature above

continued

1925
BALLOON TIRES AND FOUR-WHEEL BRAKES

1932
SAFETY HELMETS



Silicone rubber is used as formed-in-place gasket.

Ignition cable and spark plug boots are typical automotive applications of high temperature-resistant silicone rubber.

212°F or below 32°F. A car's brake system definitely does *not* meet these criteria.

The major concern with brake fluid performance is the possibility of fluid boiling under severe braking and causing vapor lock and loss of brakes. How hot does a brake system get? In a cross-country driving test conducted by the National Highway Safety Administration, brake fluid temperatures of 295°F were recorded in western mountain driving. In competition, temperatures have been known to reach 400°F. Conventional high-temperature brake fluids can take these temperatures *provided they are not contaminated by moisture*. However, almost all brake fluids are based on ethylene glycol, which continually absorbs moisture from the air, even after it is installed in the brake system, absorbing *through* the brake hoses.

As the moisture content of the fluid goes up, the boiling point comes down. For example, a high-temperature glycol brake fluid, with an initial boiling point of 550°F, will boil at about 300°F when contaminated with only 3½ percent moisture.

Unfortunately, this degree of moisture contamination is not uncommon. In a field test conducted in upstate New York, brake fluid in wheel cylinders of typical vehicles picked up three to six percent moisture within two years of service. It is not uncommon to find *10 percent moisture in the brake fluid of military vehicles in the humid Panama Canal Zone!*

As the brake fluid reaches its boiling point, vapor forms in the system and a "loss of brake pedal" will occur because the vapor must be compressed before the pressure can be transmitted to the brakes. When sufficient vapor is present, the pedal will go to the floor with *no* pressure transmitted to the brakes. This is the condition generally known as "vapor lock" and the result, of course, is complete loss of brakes.

Silicone brake fluids have the highest boiling points of any available brake fluid, with a wide safety margin over any temperature likely to be encountered in service. More importantly, this high-temperature performance will be retained over years of service since the silicone fluid will not absorb moisture. This has been proved in extensive field evaluation as well as laboratory testing.

While these tests do not prove that conventional brake fluids are unsafe, there is reasonable cause for concern. Anyone engaged in competition driving should either stick to a regular schedule for changing his brake fluid, in order to avoid excessive moisture contamination, or he should switch to a silicone brake fluid.

The same holds true for certain kinds of highway driving. Mountain driving is obviously a potential problem. Heavy vehicles such as motor homes, campers, vans, pick-ups, and vehicles used for towing could also get into situations where severe braking may cause brake fluid temperatures to reach the danger point.

Cold weather, with temperatures below zero, can also cause braking problems. At temperatures of -20° to -40°F, conventional brake fluids will become thick enough to cause a driving hazard. At these temperatures braking becomes unresponsive and uneven, and stopping distances increase significantly. Silicone brake fluids provide relatively normal braking response down to -40°F.

Moisture absorbed into brake fluid is also the chief cause of corrosion of internal brake system parts. Since silicone fluids actually repel moisture and are themselves chemically inert, they help protect the brake system from such corrosion. Salt, used extensively in some areas to melt ice and snow, is another contributor to brake system corrosion. Salt-bearing water penetrating brake hoses dissolves salt into conventional brake fluids. Silicone fluids prevent water with salt from entering the system. Incidentally, silicone brake fluids are completely compatible with both the brake system components and with all types of conventional brake fluids. However, mixing glycols with silicones degrades the performance of silicones and is not recommended.

The suitability of silicone brake fluid for highway use has been documented by a three-year, 500,000-mile field test during which there was no reported brake failure due to silicone brake fluid. Silicone brake fluids are covered under the U.S. Department of Transportation Motor Vehicle Safety Standard 116 (DOT 5).

In some instances competition drivers have reported problems with the early silicone brake fluids, the result of the high viscosity silicone fluid trapping air more easily than conventional brake fluids while being installed in the system. The problem was particularly noticeable when pressurized filling systems were used. If the air was trapped in the fluid, when the pedal was pressed hard and fast and then released abruptly the sudden increase and decrease in pressure permitted air bubbles to escape from the fluid. Temporary loss of pedal resulted and was noticed if the brakes were reapplied immediately.

This type of braking hardly ever occurs in normal driving, but it is common in racing. To overcome this problem, a special competition silicone fluid has

The Yankee Racing B Production Corvette is a laboratory on wheels for the testing and development of brake fluids and lubricants.

Vehicle number	Brake fluid	Vehicle mileage	Length of service (months)	% Water absorbed	Boiling point* °F
1	DOT 3	27,531	23	6.7	260
2	type	22,931	22	3.2	275
3	glycol	10,318	21	3.7	298
4	brake fluid	51,961	28	4.4	311
5		22,972	18		
6	Silicone	5,712	17	Less	Above
7	brake fluid	28,158	10	than	572
8		4,181	14	0.1	

FIELD TEST RESULTS from eight typical test vehicles operating in upstate New York. After 23-28 months of service, conventional brake fluid had been degraded by moisture absorption to the point of becoming a possible vapor-lock hazard (brake fluid temperatures of 295°F in highway driving and 400°F in competition have been recorded). Silicone brake fluid absorbed almost no moisture, did not boil at maximum test temperature.

**Boiling point measured by SAE Equilibrium Reflux Boiling Point procedure.*

Fig. 1

been formulated with a lower viscosity to minimize air entrapment during installation. Yankee Silicones, Inc., supplier of this special grade of fluid, tested the fluid for a full season in their own Yankee Racing BP Corvette and in five other race cars which participated in their test program. All participants in the test reported no problems with the competition silicone brake fluid and claimed better braking performance than they had previously experienced with other types of brake fluid.

Another recent silicone development is in the field of lubricants. Silicones have long been recognized as outstanding high-temperature lubricants, mainly because other lubricants could not perform satisfactorily at "silicone temperatures." However, at ordinary temperatures most silicone lubricants did a poor job compared to petroleum lubricants.

Now a whole new branch of silicone chemistry has been developed which has produced a family of lubricants that are outstanding by any standards. Called methyl alkyl silicones, they create tough lubricating films which are extremely difficult to break down. A new grease formulated from this new silicone family and containing special fillers and additives to provide higher load-bearing capacity and shear stability is solving "impossible" automotive lubrication problems.

The new silicone grease is one of the few lubricants that does an excellent job of lubricating combinations of hard and soft metals, such as aluminum to steel or stainless to bronze. It also has excellent water washout resistance, improved corrosion protection and a wide operating temperature range of from -45°F to 350°F.

In competition testing, this silicone grease solved a tough wheel bearing lubrication problem for the Yankee Racing Team Corvette. With other greases tested, frequent wheel bearing replacement was required. However, with the silicone grease the car ran for three full seasons without any serious wheel bearing wear. While yearly lubrication is recommended, this "endurance test" demonstrates the capability of this new grease.

Field evaluations have been completed by two other racing teams, using the grease in front and rear wheel bearings, universal joints, steering linkage, front end suspension, ball joints and aluminum bushings in the lower control arm. With speeds of 180 mph, temperatures over 350°F were recorded but no failures were sustained. Drivers and mechanics reported maintenance-free seasons with no serious wear on any lubricated parts, even though normally expendable items were not replaced.

The new grease is finding many additional automotive applications not necessarily related to racing. Its water washout resistance makes it useful for lubricating windshield wiper mechanisms, water pump bearings, accelerator linkages and for marine applications such as outboard motor propeller shafts. It is particularly well suited to ball and roller bearing lubrication and where outer race rotation is a factor. This versatile grease is also recommended for door and window mechanisms, valve stem lubrication and electric motor lubrication.

The uses of silicones in the automotive field continue to grow. And in many cases the development is starting on the race circuit and moving from there to the assembly line. Silicones are another important area where those engaged in automotive competition have an opportunity to pioneer in the development of advanced automotive technology.

The author of this article will be glad to answer questions on silicone brake fluids or lubricants. Write or call him at Yankee Silicones, Inc., 1705 Foster Ave., Schenectedy, NY 12308. Phone (518) 377-6441.

for the Road

New Number for Car Gripes

If your new car or truck has a defect and you dialed the toll-free number publicized in our October issue to complain, you undoubtedly reached an "out-of-service" recording. Seems the Consumer Services Section of the National Highway Traffic Safety Administration was receiving so many gripes from vehicle owners in a trial experiment over a toll-free, 10-state area that it extended the free-phone service nationwide. Because of mechanical problems, however, it was assigned a new number—800/424-9393—for callers in the 48 contiguous states. Area 202 (Washington, DC) residents must dial a local number, 426-0123.

In addition to new-car complaints, the office accepts calls from prospective used-car buyers. By reporting the make, model, and year, you can learn if a car has been subject to a factory recall. You then can check with the seller or manufacturer to learn if it has been repaired.

If You're Going to Japan or Okinawa

Personal property officials advise personnel not to take 1974 and newer model vehicles to Japan or Okinawa. Strict Japanese emission standards for late-model autos can result in shipment delays and unexpected high inspection and modification costs for military members.

There have been a number of complaints about the standards, but the problem is not in military hands and must be worked out by the State Department.

Drivers who ship their late-model vehicles to Okinawa could be faced with additional problems. Japanese customs officials can require that such vehicles be inspected in Japan before they can be driven on Okinawa.

Best advice for now is to leave newer vehicles at home.

New Engine Ups Mileage

Scientists are testing a new automobile engine that boosts gas mileage 30% by allowing the motorist to adjust the horsepower to meet the driving situation. The variable displacement engine was invented by Harvey N. Pouliot of Sandia Laboratories. It employs a mechanical linkage enabling the driver to automatically change the length of the piston stroke, or displacement, to adjust the horsepower to meet driving demands.

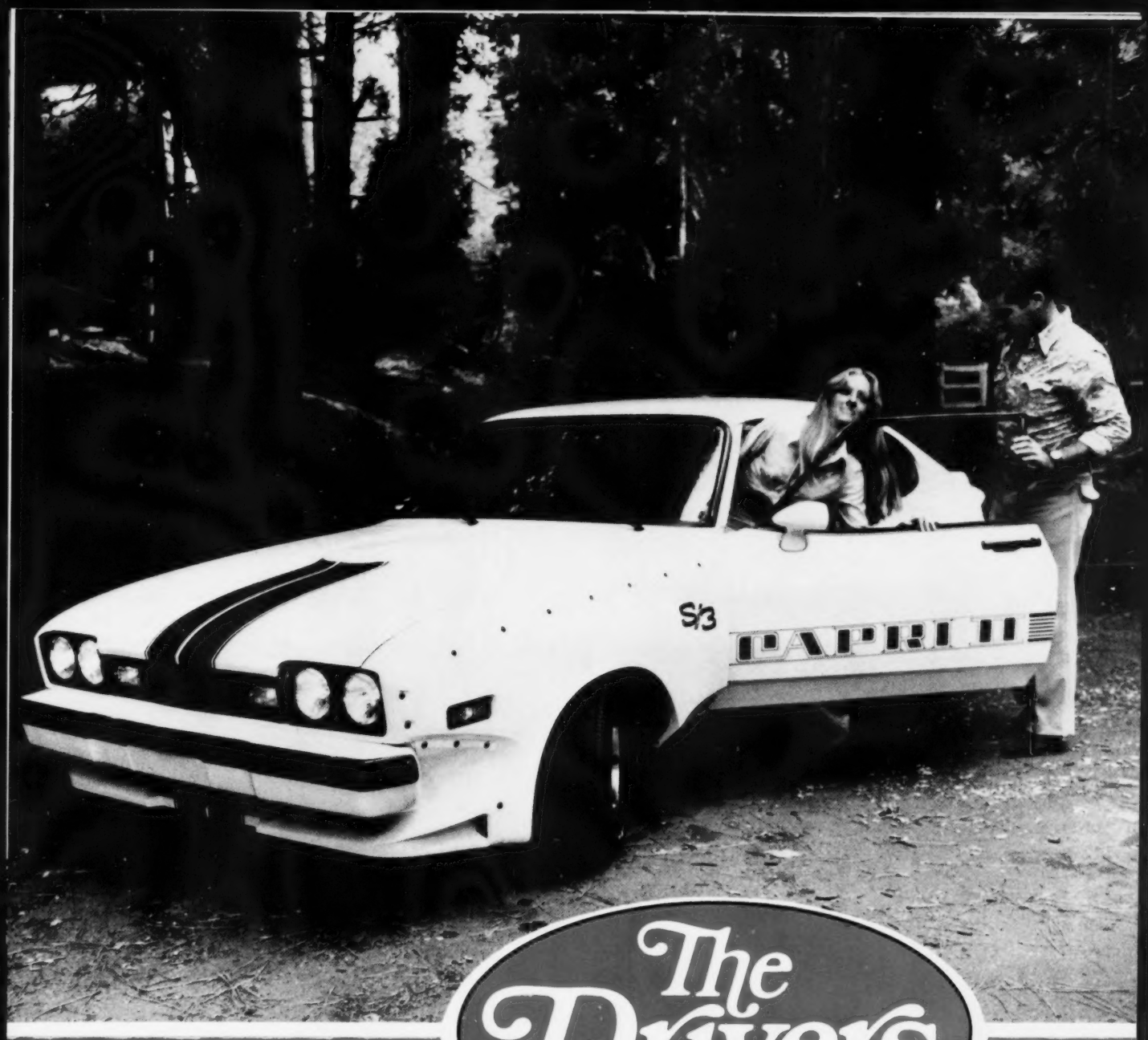
Although the engine has not yet been tested in a car, laboratory tests simulating an American family car have shown increased gas mileage of 30% with the expectation that additional refinements could increase the figure to 40%.

The new engine design eliminates the need for a throttle, a major cause of inefficiency in conventional engines. The engine is most efficient when the horsepower has been reduced to meet the lower speeds of city driving. Conventional engines are least efficient under city conditions because the carburetor is throttled to reduce the amount of air-fuel mixture reaching the cylinders. Exhaust emissions on the new engine are about the same as conventional engines and would require catalytic converter to meet clean air standards.

(opposite page)

CHASTAIN CAPRI II, courtesy of Jim Glaze, Lincoln/Mercury/Capri, Redlands, CA

T-BIRD Courtesy of Inland Motors Ford, Redlands, CA



The Drivers

Loaded with style and performance, these '77 beauties are loaded with something even better—good safety features. No matter what car you buy, don't let razzle-dazzle looks turn your head. Inspect for safety features.

Shevawn Boessen
SSgt Don Holt, DRIVER Technical Editor

BIGOTES
ALLLLRIGHT!
When
will
the
FUN
start?
WA!
WA
DRIVER

Dreaming about buying an RV and having some fun? Maybe first you should read the true confessions of a fellow who had the same dream 16 years ago—and has been miserable ever since! Or maybe he's just the most unlucky RVer we've ever run into . . .

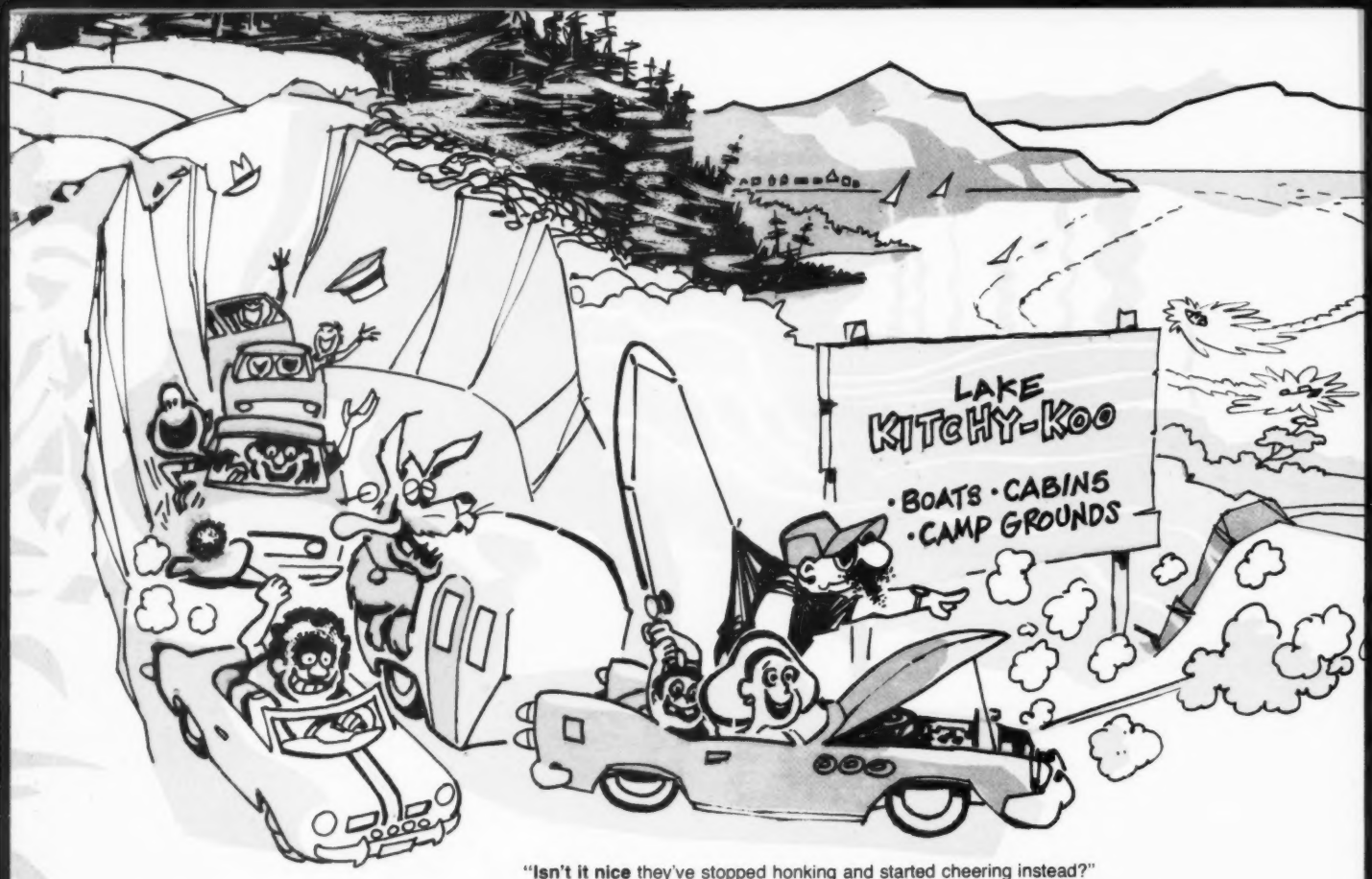
by CW4 HOWARD WELLS
Anchorage, Alaska

When does the fun start? I have often asked myself that question after arriving exhausted from a 12-hour drive to find no vacancy in the campground. Or while wandering around half the night in search of a friend's favorite camping spot, only to find a washed-out road leading to a few lonely tent sites on a 20% slope. Like the fleeting wind, that elusive fun is tantalizingly close, yet difficult to grasp.

It all began some years ago when I bought a small travel trailer. My family had thoroughly enjoyed occasional camping trips and were looking forward to using our new trailer at every opportunity. Excitement was high when we set out on our first weekend trip. The destination had been carefully selected, the route planned, the trailer packed and the engine tuned. The fun was about to start.

As we entered the freeway and increased speed past 50 miles an hour, the gentle sway of the trailer erupted into a violent wobble, threatening to destroy both the trailer and station wagon. The situation got worse with

continued



"**Isn't it nice** they've stopped honking and started cheering instead?"

each wobble. My violent manipulation of the steering wheel was always a wobble behind the trailer. Heavy braking, plus a little prayer and a lot of luck, and our first trip ended abruptly in the emergency stop lane.

We were stunned! What could have happened? The salesman had assured us that the little station wagon was more than adequate for towing the trailer. The mechanic who installed the hitch was an expert. He could install a hitch on any vehicle. He said so himself. His welding fee seemed a bit out of line, but one must expect to pay extra for the services of an expert.

The expert charged a little more for the second hitch, but it reached almost to the front of the vehicle frame. I was assured I could now tow any trailer, regardless of size.

When I returned to the welding shop the third time, I began to suspect that we should forget all about this camping business. We had thought our troubles were over when on our second trip we cautiously approached 50 miles an hour and didn't sway. Then a large bus came up from behind to pass. The turbulence left our little rig momentarily out of control. We returned home via back roads where our 40 mile an hour speed would not jeopardize safety.

The expert with the torch now advised me that we would need an equalizer hitch. I had never heard of an equalizer hitch and was deeply shocked when the service manager casually mentioned the price to be $150. Since this new piece of equipment was apparently essential to the safety of the family, I had no choice but to pay his price.

We were happy and excited when we departed on our first relatively long trip. The equalizer hitch had damped the sway. We had made a few short trips and felt confident that we were now ready for a longer, more complicated venture. Naturally, the trailer was a little overweight. We had a 30-day supply of food and clothing for the seven-day trip, but it's always better to take a little extra.

By the time we approached the Mojave Desert the blistering August sun had driven the temperature to 109°. I had to use our entire water supply to replenish the boiling radiator. After considerable discussion, it was decided that the answer to our problem was a larger, more powerful car. Our station wagon was obviously not adequate for towing the trailer.

A few weeks later, the hitch was installed on our new station wagon and we were anxiously awaiting our next trip. Thirty-five days after the warranty expired on the new vehicle, the service manager enlightened me with a bit of startling news. The transmission had overheated and would require repairs estimated at $380.

After the shock had subsided, repairs made, and we had made a few more successful trips, we decided the 16½-foot trailer was too small for this powerful station wagon with the new heavy duty transmission. It would be necessary to shop for a larger trailer. Perhaps a 20-footer would provide the space necessary for our ever-increasing list of camping gear.

Selecting a new trailer proved to be no easy task. We now had definite ideas of what was needed. It soon became apparent that our ideas could not be fitted into a 20-footer. Perhaps a 24-footer? A trailer of that size could be towed with our station wagon. However, a larger hitch with anti-sway device would be necessary.

Since it would be necessary to get a new hitch anyway, why not buy a 27-foot model and plan on using it after retirement? After making that decision, the 29-foot model looked much better and we could think of many reasons why we should have one. A 29-footer, however, would require a larger tow vehicle. Maybe a truck, or one of the vehicles now being produced specifically for towing trailers.

A few weeks later, we departed on our vacation towing a sleek new trailer with a shiny new travel wagon. Both had

been thoroughly checked by the dealer. Excitement was again running high. The fun was certain to start now.

A few miles out of town, I turned on the signal in preparation for a lane change. With each flash of the turn signal, the four 12-inch electric brakes locked the trailer wheels. During the ensuing confusion, I couldn't determine the cause of the jack rabbit leaps we were making. But finally I managed to bring the rig to a safe stop.

After allowing sufficient time for ruffled nerves to become soothed, I continued at a very slow pace while trying to locate the cause of our trouble. Thirty-five dollars' worth of an electrician's time and 24 hours delay were required to locate and correct the problem. We were again on our way to have some fun.

Adjusting to the larger rig required considerable thought. Our first roadside stop resulted in wagon and trailer mired to the axles in mud. Unless you have extracted 12,000 pounds of trailer rig from a soft shoulder in a downpour with the unsolicited assistance of a wife, three children and a dog, you won't appreciate my predicament. However, nothing is impossible and eventually we were again on our way to have some fun.

Finally we arrived in the campground, many miles from home, on the shore of a beautiful, isolated mountain lake. I had $1.17, a book of blank checks, and a ball-point pen. I then drove a hundred miles in search of a trusting friend who could convince a banker that my check was good before we could buy food, or pay the camping fee.

While parked in the campground, I discovered the air conditioner had been crushed, probably by a tree limb; the trailer electrical system malfunctioned and boiled the batteries dry; and faulty wiring in the travel wagon blew a box of fuses on the way home. In addition to those minor problems, the rear springs on the wagon had apparently missed the heat treatment process during production. Result of this oversight was that the rear springs straightened, allowing the rear axle to bang against the frame after the rubber bumpers were destroyed. Arriving home after a week of camping, we were covered with poison oak and the entire family was suffering from head colds. Recovery required another full week.

During the lull in our activities, we had our first opportunity to conduct a thorough inspection of our new equipment. I found the trailer tail lights had never been connected and the back-up lights were not wired to the tow vehicle. The right front wheel of the travel wagon was out-of-round; this caused a violent swerve when heavy braking was applied. The transmission had developed a leak and the front wheels were out-of-alignment.

While all this adjusting and repairing was being accomplished, an unknown (hit and run) driver crushed the left front corner of our new trailer. While we were trying to decide what to do about the first dent, another was made, only inches from the first, again by an unknown driver.

While the travel wagon was parked at the curb, a small screw shorted the trailer brake control. The entire electrical harness melted and the vehicle would have been destroyed had I not been nearby and removed the battery cable. But again, after much time, effort, and a few hundred dollars, we set out to have some fun.

Our first moving incident occurred while exiting a campground up a short, steep hill. A fat lady stepped in front of the rig, forcing me to stop. I continued up the hill after some difficulty getting started. My preoccupation with getting started on the hill resulted in a moment of carelessness. I departed with the small check-in station hanging on the side of the trailer with a foot of its roof sticking in the top of the rig.

Two weeks and $680 later we were on our way to have some fun.

Now, the Klamath River in northern California is considered one of the best for steelhead and salmon fishing. While traveling south out of Medford, I noticed a highway paralleling the river. A quick check of the map showed the highway paralleled the river to the junction of the Trinity River. Never one to pass up a chance to fish a new river, I turned off the freeway. I explained to my family that a side trip down the mighty Klamath would be enjoyed by all. I was even more enthusiastic about the trip after checking with the Ranger Station on road conditions. I was assured there would be no problem towing the trailer through to Eureka.

South of the village of Orleans, the road started getting narrow and we encountered construction signs. Shortly thereafter, the temporary road turned to dirt with indications that it would get much worse before it got better. After a few miles, I was unable to turn back and afraid to go on. The detour road, a temporary section, appeared to have been blasted out of the side of a mountain of rock. In places it was only inches wider than the trailer. Several times, the trailer wheels dislodged rocks that dropped into the Klamath hundreds of feet below. This improved trail that the Ranger assured me would present no problem followed the contour of the mountain. Consequently, the road was a maze of turns both left and right, many with a radius approaching the minimum turn radius of the rig. Road visibility was measured in feet with an occasional breathtaking glimpse of the trail far around the mountain. We were able to cover 50 miles in just over six hours. This experience ended our camping for a period of six months while time healed our scars of fear and frustration and my wife reconsidered her threats of divorce.

Eventually, we found ourselves back on the road again in search of fun. We noticed there were many more motor homes now on the road. Some of our friends had made the transition and seemed to be more satisfied with their new rigs. Perhaps we should consider a motor home. The increased comfort of being able to move around while traveling should cure the children's restlessness on long trips.

Although shocked at the prospect of paying over $10,000 for a mini-home, we shopped while continuing to camp in our trailer. After a few months we had convinced ourselves that a motor home was essential to our continued camping comfort. The trailer was outdated and difficult to tow. It would soon need repairs. It required too much time to hook up and set up. In addition to all those good reasons for trading, this was a perfect time to purchase a motor home. We had started shopping for a mini-home, but soon graduated to looking only at 25-foot models. Finally settling on a 29-foot model, I called our banker.

I have just returned from the factory with our shiny new rig. The water heater works, the electrical system works, the heaters, air conditioners and refrigerator work. Everything seems ready to roll. The fun will surely start now!

TIMELY TOPICS

NEW NHTSA TEST FACILITY TO OPEN AT OHIO CENTER

Testing of motor vehicles and motor vehicle equipment for possible safety defects is scheduled to begin this fall at a new engineering test facility operated by the U.S. Department of Transportation.

The department's National Highway Traffic Safety Administration (NHTSA) began staffing the facility, located at the Ohio Transportation Research Center near East Liberty, Ohio, on July 19.

Joseph H. Clark, Jr., director of the engineering test facility, said the federal safety agency already is receiving equipment and supplies at the test facility site. "Our initial staff of 11, which includes engineers, technicians and clerical support, will be engaged in checking testing equipment and preparing operating procedures in anticipation of testing in September," Clark said.

The engineering test facility plans to add 15 to its staff later this year, and maximum staff may reach 56. In addition to leasing the building space, the government will have access to other facilities at the Ohio Transportation Research Center including a 7½-mile high-speed track, a 2,500-foot skid pad with approaches and return loops, a 50-acre vehicle dynamics area, and a high acceleration crash simulator.

While the work performed at the engineering test facility primarily will involve testing of motor vehicles and motor vehicle equipment for possible safety defects, other testing, such as compliance testing, also will be performed as time permits.

BRITISH LEYLAND RECALLS TRIUMPH TR-7s

British Leyland Motors, Inc., is recalling 13,081 of its 1976 Triumph TR-7 models to correct a possible steering problem.

The company said the weld holding the lower suspension link attachment bracket to the rear axle casing may be defective on some cars. Under extremely rough driving conditions, the bracket could partially separate from the axle casing. Should the weld fail completely, loss of steering control could result.

SPECIAL GUIDE OFFERED HANDICAPPED TOURISTS

Determining not only the most interesting but also the safest sights to see in a big city is no easy task. But for a handicapped person, it's imperative.

The nonprofit Junior League of Los Angeles, Inc., publishes a 52-page guide for just such persons as a public service. Titled *Around the Town with Ease*, this digest-sized booklet contains a location map and detailed information on 108 of the most famous and interesting public attractions in the greater Los Angeles area and San Diego. You can know in advance about parking requirements; best entrance to use, door size, etc.; steps—size and number; curbs; railings; floor surfaces; elevators; floor levels; seating; food; restroom sizes and facilities; and medical facilities.

If a relative or friend of yours is handicapped and will be visiting Southern California, you can get this little gem free by writing to the League at Farmer's Market, Third and Fairfax, Los Angeles, CA 90036.

SNIFF, SNIFF . . .

What do rotten eggs and catalytic converters have in common? Would you believe smell? This rather distinct odor (actually hydrogen sulfide) is generated by the converter whenever the available oxygen supply is insufficient to oxidize all the hydrogen in the exhaust gases.

If you're unfortunate enough to be plagued by this problem, check out your car for one of the following conditions:

- Carburetor adjustments incorrect, such as:
  1. Choke set too rich.
  2. Idle air/fuel mixture set too rich.
  3. Metering rods (on some carbs) set too rich.
  4. Float level too high.
- Choke not opening fully or not opening soon enough, caused by:
  1. Leaking choke cover gasket.
  2. Blocked choke hot air tube (heat riser).
  3. Choke linkage bent or binding.
  4. Power valve (on some carbs) leaking.

YOU THINK YOU'VE GOT TROUBLES NOW . . .

Just wait until you replace that broken automatic transmission and the new one goes out to lunch 50 miles after you install it!

What you've probably neglected to do is drain and flush the automatic transmission cooler. These coolers are usually combined with the car's radiator and have tubes running back to the auto trans. When you break a transmission, bits and pieces of seals, gears, etc., flow through the cooler lines and, if not removed, can cause the new transmission to break too.

Since cleaning the cooler and lines can be difficult and expensive, install an in-line filter when you replace the transmission. Change it after the first 5,000 miles and about every 25,000 miles thereafter.

IF YOU GET WATER . . .

In the passenger compartment of your Aspen, Volare, Dart, or Valiant, and wonder where it's coming from . . . search no more. DRIVER has the answer!

The water enters through an unsealed emergency brake release cable grommet. Simply pull back the carpet and put some silicone sealer around

the grommet and cable-routing hole.

Check also to see if your car has an external splash shield in the left wheel housing. If not, it's Chrysler Part No. 3875943.

CAR DEALERS FUDGE

No, it's not something you eat, it's something car dealers sometimes do in their advertisements. Read over the following list, and when you see the "come-ons" in automobile advertising, check them out to see what some dealers really mean.

■ CLASSIFIED ADS: Dealers will often place classified ads and omit the dealer name and phone number, thereby making you think the ad was placed by a private party.

■ 1976 . . . SUPER LOW PRICES: What they don't tell you is that these have been taxis or rental cars and may have 10,000 or so miles on them.

■ THIS CAR ONLY $3500: When you get to the lot, you find that "the car" has been sold, but they "have one just like it" right over there. Chances are it's the same car but now the price is $4500. Ads *should* specify serial number, so this trick can't be pulled.

■ AT DEALER COST, BELOW WHOLESALE, OR BELOW INVOICE COST: These terms are so vague as to be meaningless, and the Better Business Bureau and Consumer Affairs people advise you to stay away from this type of come-on.

■ YOUR TRADE-IN WORTH MORE HERE: Sure it is, when then they jack up the price of the car you want to buy to equal the amount of the over-generous trade-in.

■ $500 FOR ANY TRADE-IN: When you get there they tell you "except that particular model you happen to be driving." Or, "except that your car has too many miles on it."

■ WITH STANDARD FACTORY EQUIPMENT OR FULLY EQUIPPED: Sure they're fully equipped . . . with a horn, engine and tires. A manufacturer's base-model stripper with about three items of "factory equipment" is usually the gimmick here.

■ TUNE-UPS ONLY $14.95: And the tune-up you get for $14.95 is only half the one you get for their regular price of $30.

Granted, most automobile dealers are honest, but many of them have used these or similar ploys at one time or another. The prime purpose of ads like these is to get you into the dealership where the salesman can make his pitch. If you answer ads like those above, be prepared for a high-pressure sales pitch that you may find hard to resist.

PACERS RECALL

American Motors Corp. announces recall of 19,581 1976 Pacers because they may contain a rear seat back hinge assembly with a shallow staking impression on the shoulder rivet that mounts the seat back latch to the hinge arm. Passengers could be injured if the car stops abruptly and the rear seatback folds. Dealers will make the necessary repairs at no cost. For more information on the recall, contact AMC by calling its toll-free hotline, 800-521-7000 (in Michigan: 800-572-9570).

TRUCK RECALL

Ford Motor Co. has announced recall of over 10,800 1976 model F-250 and four-wheel drive light trucks because of a possibility of a partial loss of braking power. Owners of the affected vehicles will be contacted directly through a notification letter and instructed as to what to do. However, for more information about the recall, consumers can contact the National Highway Traffic Safety Administration (NHTSA), Washington, DC 20590. In the 48 contiguous states, call toll-free 800-424-9393. If you reside in Washington, D.C., call 202-426-0123.

ARC-WELDER RECALL

You Backyard Mechanics who have purchased a hobby-size arc-welder manufactured by Midway Electric Arc Welder with a model designation of DD, D, E, F, DS, or K, should be aware that the Consumer Product Safety Commission has ordered the recall of these units.

The CPSC found that the construction of these welders allows power-supply voltage to reach the electrodes directly; this could cause anyone contacting them to receive a shock. Also, the unit's metal housing lacks thermal insulation and could pose the threat of skin burns.

If you own such a rig, mail it to Western Manufacturing and Supply Co., 1400 W. 22nd St., Kearney, Nebraska 68847, Attention: Mr. P. Bashore. You will be reimbursed for the cost of the unit, plus postage.

MARYLAND BANS LIMITED WARRANTY ON USED CARS

The Maryland Motor Vehicle Administration has banned use of the "as is," "50-50" and other limited warranties often offered by used car dealers.

An MMVA bulletin says that anyone who tries to restrict an "implied warranty of merchantibility" on a car sold in Maryland could be subject to charges leading to the revocation of license.

Implied warranty of merchantibility means the car must be in good working order at the time of sale.

The Maryland Independent Automobile Dealers Association said that while dealers will honor the implied warranty, they will continue giving restrictive warranties.

If you're planning on buying a used car in Maryland, check with the Maryland Motor Vehicle Administration before you make the deal . . . it may save you warranty hassles and/or money.

IN THE DRIVER'S SEAT

The 146th TAW, ANG

The cars of the Air National WHAT?

Lessee, I just know I've heard that name before . . . Air National Guard . . . I remember it has something to do with the Air Force, but I can't recall just exactly what!"

If that's your reaction to the Air National Guard, don't feel like the Lone Ranger. A lot of us tend to take the Guard for granted, and sometimes we forget that they're a part of the AF team just like any other AF organization.

DRIVER recently received a phone call from TSgt Al Pakcyk of the 146th Tactical Airlift Wing ANG at Van Nuys, California. Al asked us when we last did an article about the Guard troops, and we had to admit that although we've featured Guard individuals before, never had we devoted a feature to the Guard per se.

We reminded Al that DRIVER is about cars and bikes, and asked him what the 146th had to offer that would possibly interest our readers. He replied with that famous TV game show line, "Come on down."

So, down we went. We came away with the pictures and info that follows, and a reaffirmation of the knowledge that Guard people are part of the Air Force and that they like cars just as well as the rest of us!

What impressed us most about the cars shown here is that with one exception, they've all been updated with seat belts, they've all been reconstructed or modified with safety foremost, and some of them even sport on-board fire extinguishing systems!

OK, folks, read on . . . 'cause this month, the 146th TAW is . . . *IN THE DRIVER'S SEAT.*

continued on page 28

1
Lt Stephen Cooper, a "Gator" for the 146th, believes his '63 Cobra was originally the pet snake of the late Ken Miles, one of Team Shelby's best drivers. The aluminum-bodied car is about 80% restored with one major mod left to do . . . replace the engine with a smaller one! Car now runs a 400+ hp Boss 302 with an Autolite, in-line, 4-bbl carb and tends to torque the chassis into a pretzel. Lt. Cooper expects the smaller (300+ hp!) 289 engine will be a little easier to use on the street. Seat belts in this car could be used to moor the Queen Mary!

2
This '36 Ford Deluxe Sedan delivers 18 mpg for Sgt Phil Kriger. Phil says the V8-85 is "the most reliable car I've ever owned." He also owns a '59 Arnolt-Bristol, a '29 Austin Bantam, and a '30 Ford Panel Delivery. Phil has operated his own body shop, and that may account for his interest and skill in restoring old cars.

3
Capt Byron "By" Smith is a real FoMoCo devotee. The '55 T-Bird is original except for minor restoration work, and the '65 Lincoln 4-door convertible (Capt Smith calls it "Ol Slabside") originally belonged to Lucille Ball.

4
American Motors AMX Pro-Stock drag racer is owned by Sgt Dave Vigginelli, a motor pool technician. Dave hopes the car, powered by a 406 cube engine, will turn low 11- or high 10-second elapsed times in the quarter mile, with speeds nearing 130 mph. As with all race cars, there is bracing, gussetting, padding, and bracketing everywhere.

5
We wish you could see the paint on this '53 Caddy El Dorado . . . it's almost perfect. The car was purchased new by Capt Bob Bradshaw's father, and Bob hopes to give it to *his* son eventually. Cadillac only built 537 El Dorados in '53, and their original cost was over $8,000. The low-slung looks and the chrome wire wheels are right from the factory.

6
TSgt Doug Crone "just kinda restores Porsches" for a hobby. He's "just kinda restored" this '66 Porsche 912 to perfection. The only thing Doug didn't do on this car was the headliner. The paint is just incredible, as is the mechanical detailing and the hotted-up 1750 cc engine. The car just can't be told from new. We would venture that this Porsche is better and safer than the day it rolled off the assembly line.

7
'63 split-window 'Vettes are rarer than hen's teeth here in Southern California, but SMSgt John Cooper's desire for one was not to be frustrated. John caught the 'Vette bug from his sons, but his wife gets the benefit . . . she drives it most of the time while John is only allowed a few weekends!

8
MSgt Norman Olsen has just the car for those of you with "back seat driver" trouble! Just put 'em in the back seat of this nice '38 Buick 90 Limited and put up the divider glass. Limo also has two radios, jump seats, and an intercom so you can communicate with the driver if you wish. Car also has more than four years of Norm's work in it!

9
With more than 33 years in the Air National Guard, CMSgt Charles M. Walton can tell you about job stability! He can also tell you that his 1948 Cessna 195 will carry five people and their luggage at 175 mph (TAS) for 1,000 miles. The 300 hp Jacobs radial engine makes the Cessna just as efficient as its newer cousins. Sgt Walton logs in excess of 150 hours per year with his Cessna, almost as many as he puts on his bike(s).

10
Speaking of bikes, how about this '54 Ariel Square 4 with Steib sidecar! It is one of six Ariels that CMSgt Walton owns. He says he likes Ariels because of their construction and because of the sound they make. The sidecar was his wife's idea . . . she wanted to get involved in motorcycling, too, but not as a passenger on a solo seat! This beautiful Steib sidecar, complete with its own hydraulic brake system, was pin-striped by the famed painter, Von Dutch. Last year, Sgt Walton and his wife toured to the Grand Canyon with Steve McQueen and Ali McGraw as riding companions. The motorcycle, a 4-cylinder that predates the 4-cylinder Hondas by 20 years, is known as "The Rolls-Royce of motorcycles."

1

2

3

4

5

6

7 9

8 10

THE BACKYARD MECHANIC

THE SUSPENSION SYSTEM

CASTERCAMBERTOEIN?

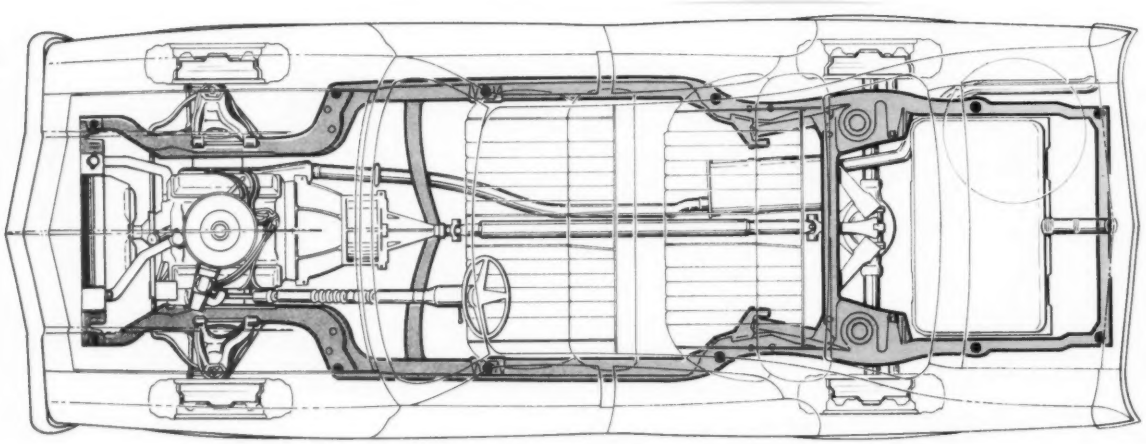


Fig. 1

Most common frame is perimeter type shown. Disadvantages are weight, lack of structural integrity in certain accident situations.

The frame is the backbone of an automobile. All other major parts are welded, bolted, or somehow connected to the frame. Basically, there are two types of construction.

The most common is the girder frame consisting of a rectangular network of girders that outline the car's ultimate shape (Fig. 1). Other forms of girder construction include the X-shape and I-beam frames.

The other type is the "unit-body" design. The body is a stressed unit, rigid enough to support the various attachments (Fig. 2). This kind of construction is more properly known as "monocoque," although the term gets little use in this country and originates from road race car design. For some conventional domestic passenger cars, portions of the girder frame have been adapted to a partial monocoque on which mount the engine and front suspension. In many cases, a similar "subframe" is added at the rear to mount the rear axle and suspension. The advantages of monocoque and partial monocoque construction are a reduction in weight and generally increased structural integrity (rigidity) of the complete auto.

SUSPENSION

It would be a simple matter to bolt or weld short axles to the four corners of the frame, but they would transfer the shock from every deviation in the road to the occupants' spinal columns. Therefore, a flexible, shock-absorbing link is needed between the wheels and frame. Such a link (the wheel suspension) should also hold roll, pitch, and yaw to a minimum.

Originally, automobile axles were heavy, solid beams with ends machined to accept the wheels. Leaf springs, strips of spring steel of graduated length (Fig. 3) suspended the frame over the axles. This setup was a direct steal from the horse-drawn carriage, and wasn't up to the tasks imposed by the greater speeds attained by the auto. There were, necessarily, some problems.

Without some sort of damping, a spring will continue to compress and rebound after a bump is crossed. This will cause the wheel to bounce up and down, repeatedly, spending only part of its time on the road. So, someone invented hydraulic shock absorbers to damp the rebound of the springs and keep the wheels on the ground at all times.

Another problem with the solid axle is "common reaction." As long as the deviations in the road surface affect

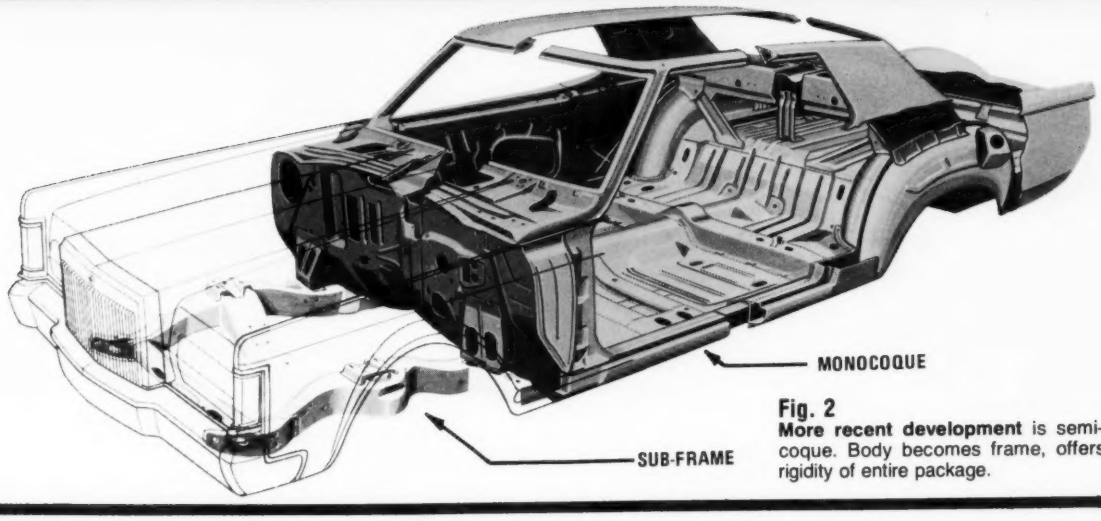


Fig. 2
More recent development is semi-monocoque. Body becomes frame, offers more rigidity of entire package.

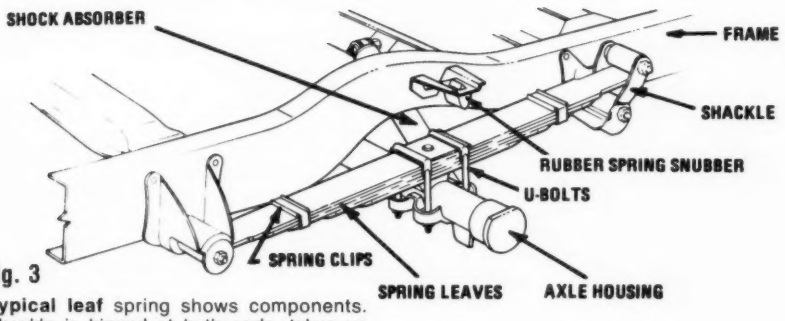


Fig. 3
Typical leaf spring shows components. Shackle is hinged at both ends, takes up changing length of spring during movement.

both wheels in exactly the same way, at exactly the same time, the reaction is not so violent. But, as shown in Fig. 4, when only one tire hits a bump, the other side reacts along with the affected wheel. No doubt, some interesting tire wear patterns and handling characteristics resulted.

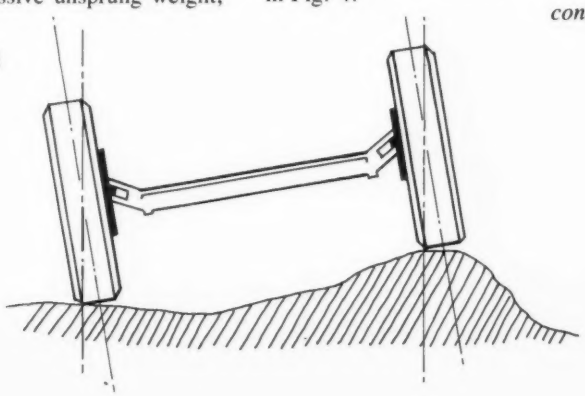
Finally, it became apparent that the amount of weight not suspended (axles, wheels, tires, etc.) reduced the efficiency of any suspension system. (Even heavier retread or recap tires add enough weight to slightly reduce handling and riding quality.)

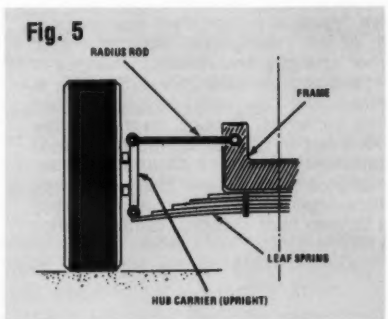
The last two problems, common reaction and excessive unsprung weight, were the prime forces behind the adoption of independent, side-to-side, suspension systems. Currently, almost all of the world's cars use independent suspension of one sort or another in front, but use of independent suspension both front and rear is largely restricted to foreign-made cars.

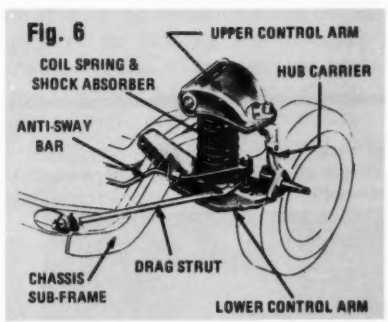
Early independent systems used leaf springs (Fig. 5), which only slightly reduced unsprung weight. Later, coil springs gained acceptance, and the weight and space savings were pronounced (Fig. 6). Typical independent suspension action is shown in Fig. 7 for contrast with that of the solid axle in Fig. 4.

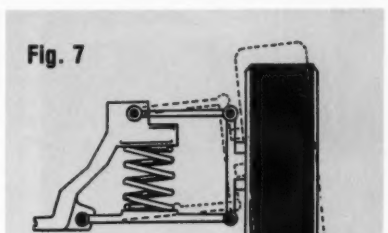
continued

Fig. 4









"Knee-action" independent front suspension is used on most cars today.

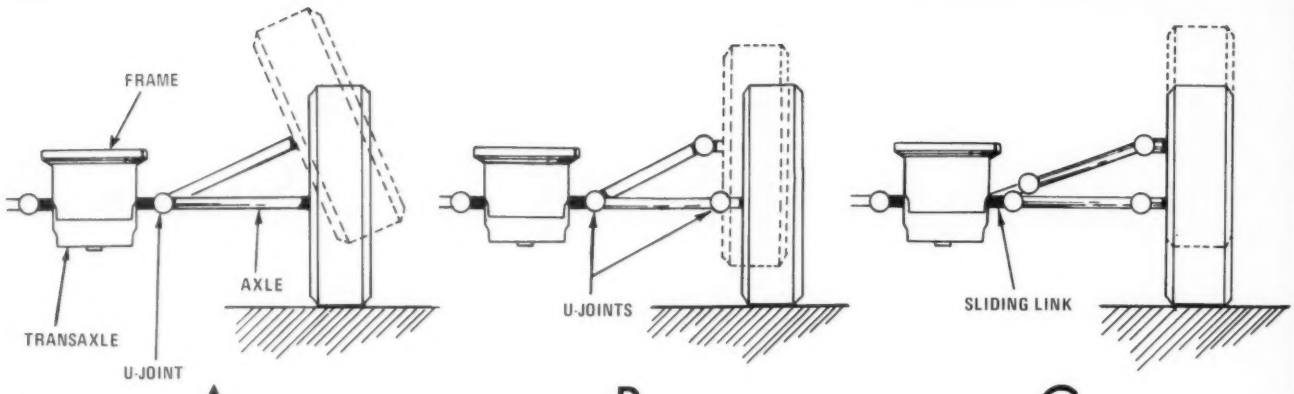


Fig. 8

Fig. 11

Three types of independent rear suspension. At left, "swing-axle" features drastic camber changes and resulting changes in track (distance between tires). Skidding is common, and tires can tuck under during severe cornering. Second diagram shows improvement in camber offered by addition of second universal joint on axle, but track change is still significant. Third, and best, is more sophisticated design adding sliding joint to keep track constant, camber change at a minimum.

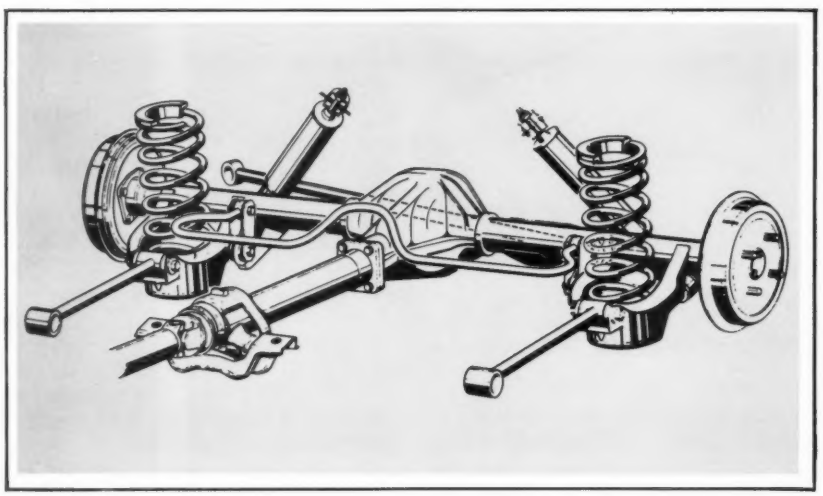


Fig. 12

Front axles are pivoted on king pins (used on straight axles) or ball joints (independent suspension).

Fig. 13

Cross-section of typical steering gear shows how turning steering wheel causes column and worm gear to rotate in like manner. Action is transferred to wheel gear which activates pitman arm, in turn moving the drag link forward and back.

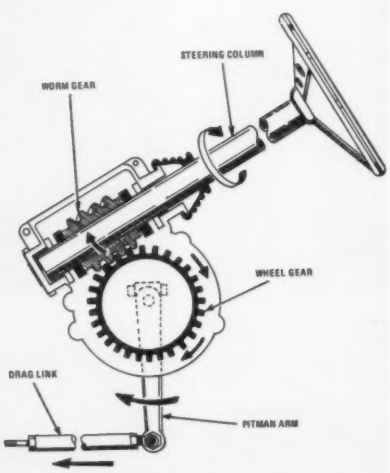
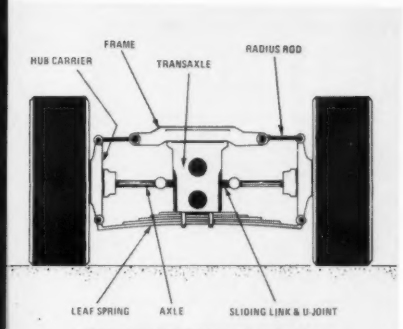


Fig. 14

Pushing drag link forward causes steering arm to move forward. Carrier and wheel then rotate about king pin.



INDEPENDENT REAR SUSPENSION

Fig. 9

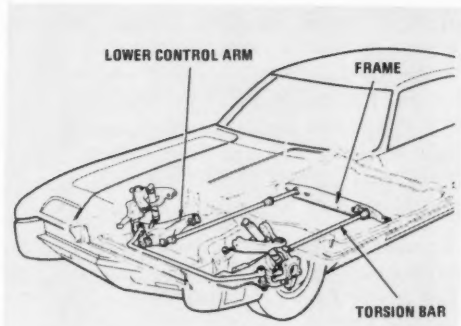


Fig. 10

COILS AND BARS

Three basic types of independent rear suspensions in use on domestic autos are shown in Fig. 8, along with the operating movement of each.

Most American cars continue to use a solid rear axle. Yet, the state of the art has advanced. Coil springs are now used on many solid axles to reduce unsprung weight (Fig. 11). Four control arms are used to position the rear axle and determine its path of movement, a function formerly performed by the leaf springs.

Another method of springing that has been developed for automotive use is the torsion bar. Simply, it's a spring steel arm that resists twisting. As shown in Fig. 10, both ends of the bar are solidly mounted, one end to the frame and the other to the suspension. The suspension end is mounted on the lower control arm, and must twist as the arm moves. The bar's resistance to the twisting provides the spring action. When torsion bars are used, weight reduction is significant.

STEERING

With all four corners of the car equipped with some sort of suspension, the front wheels must be hinged upon their axles so that steering can be accomplished. Fig. 12 shows a much simplified steering setup from a race car, which illustrates the steering operation.

The ends of the axle and hub carrier are drilled through vertically, and a king pin is fitted. The resulting arrangement is much the same as a door hinge. With the axle located on the chassis by control rods and springs, the hub carrier can rotate about the axle by riding on the king pin. (Note: Use of universal-type ball joints is required on independent suspensions.)

The steering arm at the top of the hub carrier is mated to the carrier at approximately 90 degrees. Movement of the steering arm is controlled by the steering wheel and related parts.

Finally, the tie rod (barely visible below the axle) is the link between the two front wheels. The tie rod keeps both wheels in alignment.

Fig. 13 illustrates how a steering gear (in this case, a worm-and-wheel arrangement) is activated by turning the steering wheel. The pitman arm attached to the wheel gear is thus swung back and forth through an arc below the gear case. This arm is mated to the drag link which is moved forward and backward along the length of the automobile.

As shown in Fig. 14, the steering arm moves in the same direction when the drag link is moved forward. Since it is at a right angle to the hub carrier, the carrier is moved outward at its forward edge, producing a left turn. The tie rod, now more clearly visible between axle and spring, pulls the other front wheel into a left-turn position.

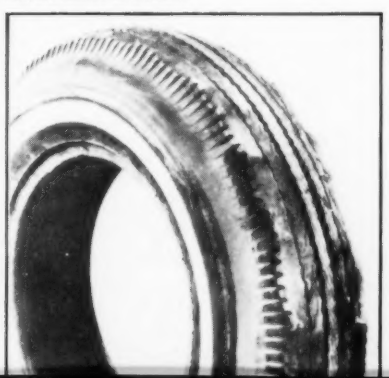
There are three basic relationships which must be maintained for proper action of the steering and front suspension systems. These are the basic items calibrated when a front end alignment is performed. If these relationships are not correct, abnormal tire wear will result (Fig. 15). The three relationships are:

continued

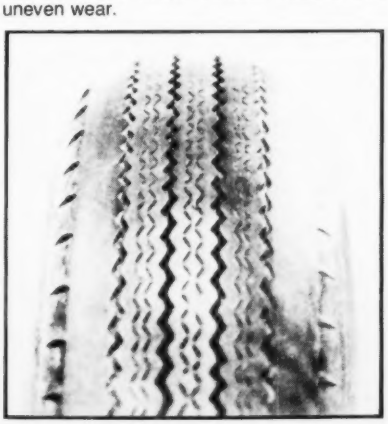
Fig. 15

(Photos courtesy of the Rubber Manufacturers Association.)

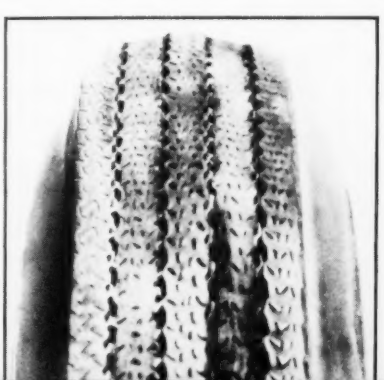
A. A single spot or a series of cuppings around the circumference of a tire may be caused by under-inflation or mechanical irregularities, but is usually the result of a combination of these.



B. Too much wheel camber caused this uneven wear.



C. Incorrect toe-in caused the feathered edge on the tread of this tire. Misalignment creates a tendency for the tire to be dragged sideways over the road.



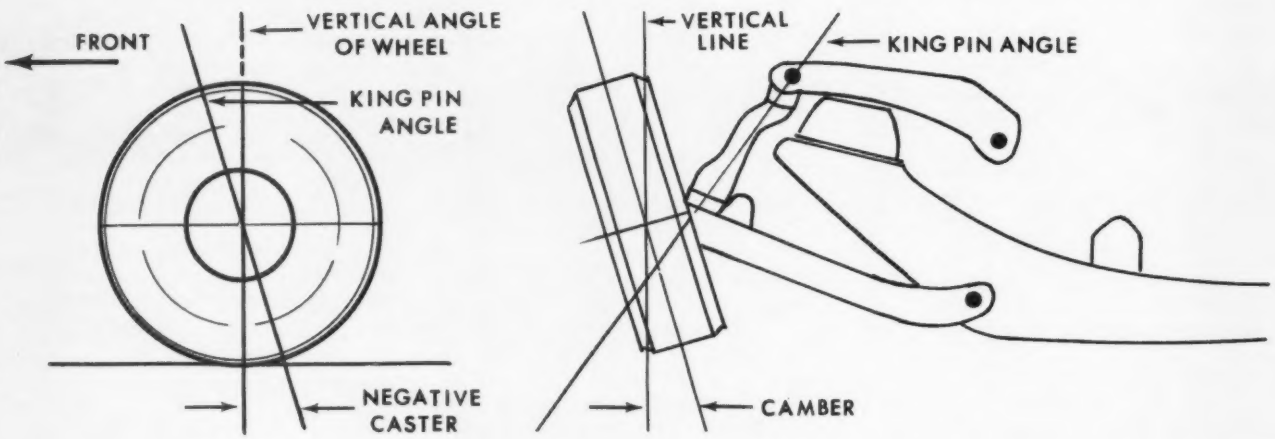
Caster. This is the vertical angle of the king pin when viewed from the side of the car. King pins are usually angled rearward at the top by 3 to 5 degrees. This gives the wheels a trailing effect and helps them return to a straight-ahead position as a turn is completed.

Camber. This refers to the difference in distance between the front tires at the top and bottom. But, "leaning" wheels tend to roll in a circle rather than straight ahead. Normally, the distance is greater between the top of the tires with correct camber.

Toe-in. To compensate for camber and make the wheels roll straight, a toe-in angle is introduced. When viewing the car from the top, the front wheels appear to be rolling toward each other.

There are, of course, many other considerations in the design of suspension and steering systems. We have covered only the basics here in an attempt to give you a fundamental understanding.

EXAGGERATED WHEEL ALIGNMENT ANGLES



CHECKING WHEEL ALIGNMENT

The following is a quick-and-dirty list of general procedures involved in checking wheel alignment. You can do most of these procedures at your hobby shop.

You'll notice we've left out specific values and measurements for individual cars. A list like this would take more space than we've got, so when you go to your hobby shop, be sure to take along your Mitchell or Motor manuals, or your shop manual. These manuals will tell you not only the specs, but will also indicate any need for special tools and gauges.

PRE-ADJUSTMENT CHECKS

- Wheel bearings must be properly adjusted (Nov '76 DRIVER).
- Steering linkage and suspension must not have excessive play. Check for wear in tie rod ends and ball joints by consulting your manuals for specifics.
- Tires should be about equal in tread wear and be balanced and inflated to manufacturer's specs.
- Car must be at curb height with full fuel tank, no passenger load, spare tire in place and no load in trunk.
- Car must be on level floor at normal running height (bounce car several times to settle it to running height).
- If the steering wheel is not centered with the front wheels in the straight-ahead position, correct by shortening one tie rod adjusting sleeve and lengthening opposite adjusting sleeve.
- Insure lug nuts are tightened to manufacturer's specs.

STEERING AXIS INCLINATION

This is a check for bent or damaged parts and not a service adjustment. Car must be level (both crosswise and lengthwise) and camber should be within limits. If you can't bring the camber within limits and steering axis inclination is correct, steering knuckle is bent.

If camber and inclination are incorrect by about the same amount, upper or lower control arms are probably bent. Replace parts* and recheck all front end adjustments.

TOE-IN

Measure toe-in with front wheels in straight-ahead position and steering wheel centered. Adjust by loosening clamps and turning adjusting sleeve or adjustable end on right- and left-hand tie rods equally and in opposite directions to maintain steering wheel in centered position.

The face of the tie rod end must be parallel with the machined surface of steering rod end in order to prevent cocking (and then binding) of the ball end while in service.

When tightening clamps, *make certain* that clamp bolts are positioned so that there will be *no* interference with other parts throughout the entire travel of the linkage.

Right, we said* **replace, *not correct by attempting to* **straighten** *parts.*

BACKFIRE

LETTERS TO THE EDITOR

Address your letters to:
Editor
DRIVER Magazine
AFISC/SEDD
Norton AFB CA 92409

SEAT BELTS SAVE LIVES—WHY?

I am continually amazed by the various statistics which indicate that automobile seat belt usage is significantly less than 100%. I read that about five out of every 10 people are sitting *on* their belts rather than fastening them (seven out of 10 is closer: *Ed note*). I believe that Air Force people have better than a 50% buckle-up rate, but I have observed substantially less than 100%.

I wonder how much time was spent last year trying to disconnect seat belt warning buzzers (or ignoring them), or how many knots were tied in automobile seat belts in efforts to fool the "interlock" systems.

Why? Perhaps people are tired of warnings, rules and laws imposing on their indifference. Therefore, my comment is free of fearful admonitions or nasty pictures. It is simply intended to lend reasons to the thinking person.

The way I see it, seat belts save lives and reduce injury for four main reasons. First, they prevent "ejection" from the vehicle. Being "thrown clear" of the vehicle may sound nice, but accident statistics indicate that your chances of survival are drastically reduced when you are ejected. The vehicle acts as a protective capsule – it has mass which resists accelerative forces, and has crushable space which tends to reduce the occupants' rate of deceleration in a collision; also, most modern cars have considerable internal padding.

Second, seat belts prevent the "second collision." Unrestrained occupants, for an instant, effectively become free bodies in the vehicle after an impact. They continue forward at substantially the original velocity of the vehicle until they collide with its interior. Decelerative forces acting on unrestrained occupants exceed their bracing abilities in all except the most minor crash impacts; therefore, second collisions tend to be uncontrolled. Forces which might otherwise be within human tolerance are applied to more vulnerable body areas.

Third, seat belts apply the decelerative force to the hips and chest. A two-inch seat belt gives the occupant an approximate contact area of 40 square inches, and a three-inch belt or a combination two-inch lap-torso restraint offers about 60 square inches. The effect of applying the force to the hips and upper torso while distributing it over a greater part of the body significantly increases the human tolerance to deceleration. *Load distribution* makes sense.

Fourth, seat belts reduce the deceleration forces on the restrained vehicle occupant. During a collision, seat belts yield and effectively attenuate high frequency acceleration transmission. More simply stated, the belts tend to stretch a little, and by stretching they reduce the peak "G" forces on your body.

So, there you have it. Seat belts keep you in the car, prevent you from striking the vehicle dashboard, and apply, distribute and reduce otherwise lethal forces.

Seat belts are not a panacea for poor drivers, nor are they 100% effective, but they work, and they are the single most cost-effective safety device ever developed. Be smart, go with the odds, and buckle up!

Capt George R. Thomson, Jr., USAF
Safety Officer, AFROTC Det 867
Norwich University
Northfield, VT 05663

DO WHAT YOU WANT—BEAR THE CONSEQUENCES

Major Campbell (Sep '76 Backfire) touched upon an important concept. (Insurance payments and assignment of negligence would depend on use of safety devices.) Making people responsible for their actions rather than proscribing or prescribing those actions in detail is fundamental to free social and political intercourse. His idea is law in Great Britain, but with a more equitable distribution of financial responsibility: persons injured because they failed to use installed protective devices share the financial burden equally with the party who would otherwise be liable. In Maj Campbell's example, he would be liable for all damages to the car and driver and for half the damages to the passenger.

Presumably, the law could be extended to reasonable add-on protective devices by requiring, say, motorcycles to be sold with one helmet for each designed passenger seat.

The principle more reasonably should read: You do what you want: *responsible* persons bear the consequences. After all, the neglectful passenger in that hypothetical example would have received no injuries, belt or no belt, if Maj Campbell had not neglectfully struck her car.

Lt J. F. Renish, MSC, USN
Naval Regional Medical Center
Oakland, CA 94627

There are a lot of ways to look at this matter, aren't there? Perhaps you noticed that the California Supreme Court has just said that because 70% of all motorists do not use restraints, failure to use them cannot be considered contributory negligence. This is exactly contrary to a decision two years ago from the New York Supreme Court. However, the California Supreme Court ruled in absence of law on the subject, an absence which can be easily corrected by the Legislature.

SCUBA DIVING

As a certified scuba diver, I read your article "Scuba Diving" (Aug '76) with great interest. Your treatment of an exciting and rapidly growing sport in a few short pages is commendable.

There are a few basic points that I believe need clarification.

continued

The reason a scuba cylinder is placed in a tank of water is because of the increasing temperature of the cylinder as it is filled. The water acts as a coolant so the tank may be filled more rapidly. Should the tank explode, the pressure shock wave will be transmitted through the water undiminished and tear apart the water container. Tank filling is best left to the better dive shops.

The life vest is now being taught in dive classes to be an essential piece of equipment just as the mask and fins are. The vest can be inflated orally or by puncturing a CO_2 capsule. A BC (buoyancy compensator) is a little more elaborate in that it can also be inflated through a rubber hose attached to a low pressure port on the regulator or from a separate bottle attached to the BC itself. No safety conscious skin or scuba diver would ever enter the water without an inflatable life vest.

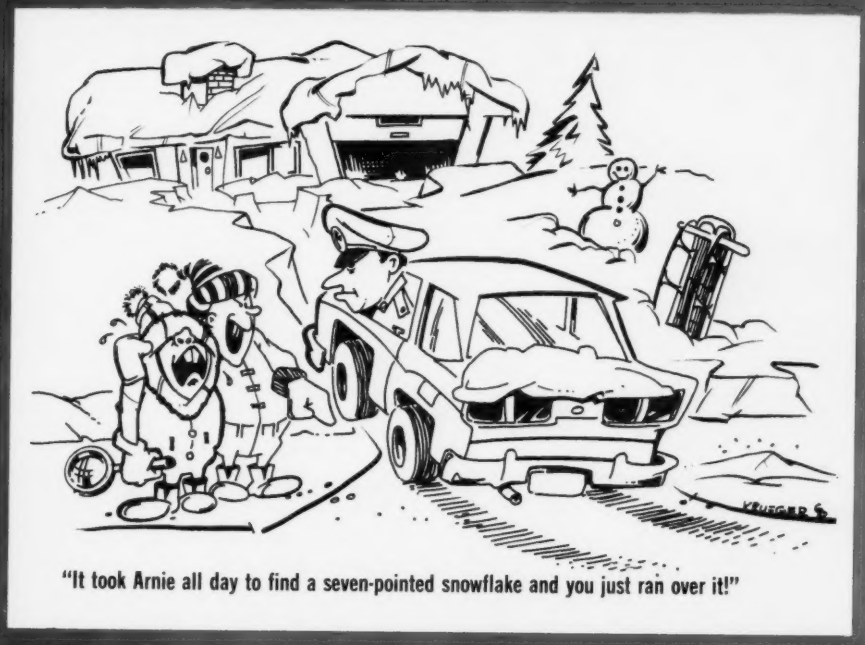
Panic is the diver's worst enemy, and only proper instruction leading to certification and practice will bring about a cautious, educated confidence required of a good diver.

2d Lt William W. Selah, USAF
HQ Elec Sys Div
Hanscom AFB, MA 01731

In the August 1976 issue of DRIVER, an article entitled "Smoking Pot and Drivin' " included a photograph of the hands of a marijuana smoker rolling a joint with a mechanical cigarette rolling device and a plastic bag labeled "The Tinder Box" lying a few inches away. The bag was being used by the smoker to carry marijuana. "The Tinder Box" is an international chain of quality tobacco stores and there was no intent to indicate that any of the company's products or activities are in any way illicit. The marijuana was placed in the bag by the smoker after the tobacco had been emptied out.

This Chevy-powered sprint car, owned by SMSgt Robert Crowell, 146th CAMRON, sees duty at Ascot Raceway, Phoenix, Santa Maria, El Cajon, Chula Vista, and Speedway 605. Car has a fuel injected, 480 hp, 350 cid engine, is equipped with fully padded cockpit and roll cage, fuel bladder, nerfing bars, seat belts, and shoulder harness. Methanol, with half the BTU rating of gasoline, is used for fuel.

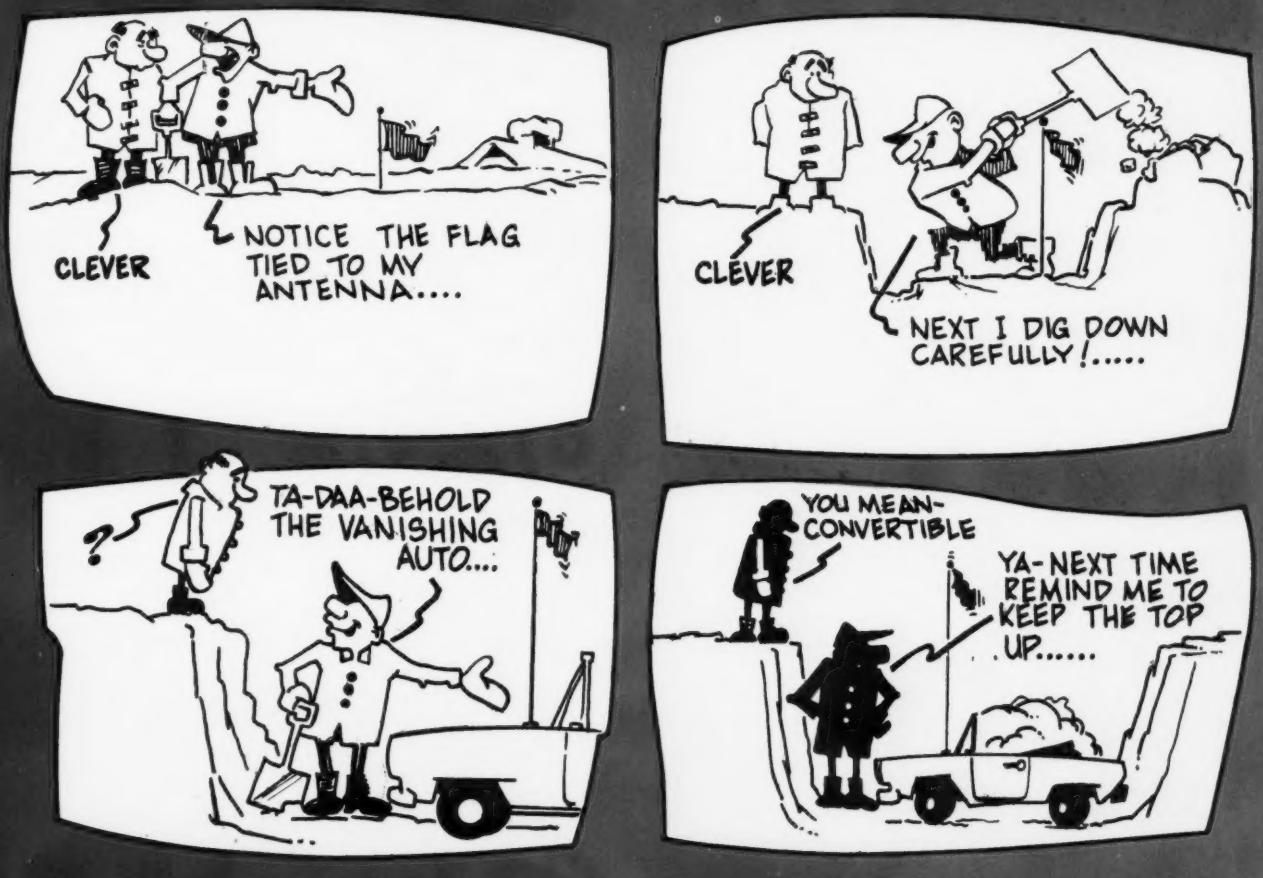
TSgt Al Pakcyk is definitely a Ford man! With a '28 Roadster and a '32 Coupe, Al travels in style. The '28 is a modern rendition of the street rod, while the '32 is a newer but more traditional approach. Both cars are stock-appearing on the outside, but both are Chevy powered. The '32 is updated with turn signals, warning flashers, and a locking adjustable steering wheel. There aren't any fiberglass parts on either car, and those of you who have built cars recently know how hard it is to find all those real steel pieces! Both cars have slightly boxed frames to increase handling and decrease chassis flex, and both cars have matched late-model Ford brakes that make them stop just as well as they go. Cars also have automatic transmissions to complete the update, and the Deuce even has stereo! Like all the cars we saw at the 146th, these are constructed with safety as well as style taking first place on the priorities list.



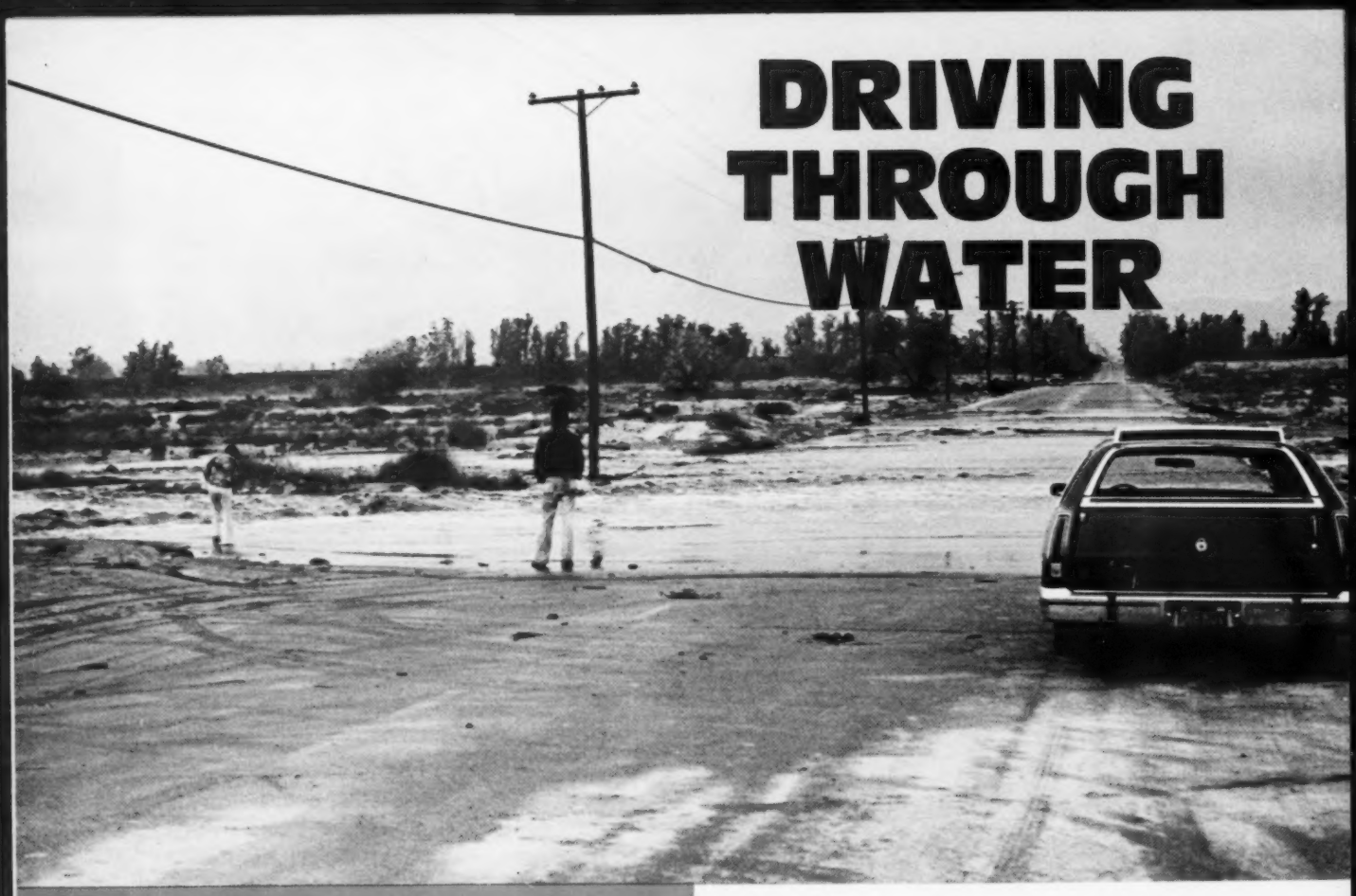
"It took Arnie all day to find a seven-pointed snowflake and you just ran over it!"

the vanishing auto

by Ava Lancho

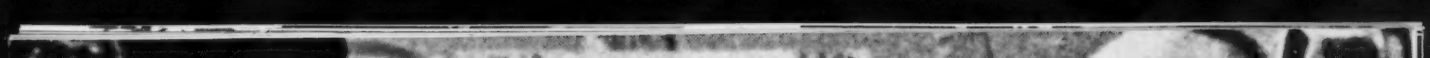


DRIVING THROUGH WATER



Winter rains and snows can lead to

ENGINE DROWNOUT!
BRAKE FAILURE! LOSS OF CONTROL!

Do you know what to do?

- If you don't know the depth of the water, don't go through.
- If you go through deep puddles or high water, go slowly.
- Realize your car can stall out if water is thrown up into the engine compartment. A car going in the opposite direction can throw up enough water—or road slush in a snowstorm—to drown out your engine even if you are moving slowly. If your car does stall out, try to coast to the side of the road.
- If you know the parts of your electrical system, hasten the drying out process by wiping the plugs, wires, and coil and the inside of the distributor cap with a dry rag.
- After moving through water, your brakes may have lost their stopping power. Apply brakes lightly while driving to dry out linings and other components.
- Believe in hydroplaning—your tires lose contact with the pavement and the vehicles skims over water without traction or control! It *can* happen to you. Reduce speed.
- If you are near a stream that's overflowing the road, leave the car and seek shelter. Lose the car. Not your life.